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OOTW TOOL REQUIREMENTS IN RELATION TO JWARS

D. S. Hartley III
S. L. Packard

MANAGED BY
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
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DEPARTMENT OF ENERGY

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D. S. Hartley III
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ABSTRACT

This document reports the results of the Office of the Secretary of Defense/Program Analysis & Evaluation (OSD/PA&E) sponsored project to identify how Operations Other Than War (OOTW) tool requirements relate to the Joint Warfare Simulation (JWARS) and, more generally, to joint analytical modeling and simulation (M&S) requirements. It includes recommendations about which OOTW tools (and functionality within tools) should be included in JWARS, which should be managed as joint analytical modeling and simulation (M&S) tools, and which should be left for independent development.

EXECUTIVE SUMMARY

This document reports the results of the Office of the Secretary of Defense/Program Analysis & Evaluation (OSD/PA&E) sponsored project to identify how Operations Other Than War (OOTW) tool requirements relate to the Joint Warfare Simulation (JWARS) and, more generally, to joint analytical modeling and simulation (M&S) requirements. It was envisioned that some OOTW Modeling and Simulation (M&S) needs might be supported by JWARS, as shown by Fig. 1. Some OOTW analytic tool needs might be common to the joint analytic community and require either a basis in the High Level Architecture (HLA) or configuration management in common with JWARS. Part of the relationship question also involves the support for OOTW analysis data requirements, shown as intersecting the JWARS data. It was also envisioned that some OOTW analytical functionality might overlap the operational aspects represented by the Global Command and Control System (GCCS), involving coordination between the joint M&S community and the operational community. Finally, certain OOTW analytic needs may be specific to only parts of the community, may be satisfiable by Commercial Off-the-Shelf (COTS) products, or may involve non-M&S solutions, such as checklists.

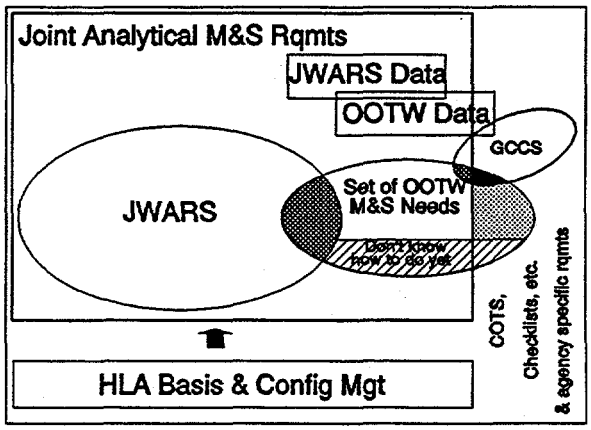

Fig. 1. JWARS and OOTW M&S needs.

The recommendations of this report rest on the following foundation of understanding of OOTW analytic requirements and JWARS functionality:

- An earlier, US Pacific Command (USPACOM) sponsored, project identified unmet requirements for OOTW analysis tools [9]. Further insight into the tools was gained through a Military Operations Research Society (MORS) workshop [15].

- The original JWARS Requirements Document [11] provided the initial specifications for the set of JWARS functionality. This document was superseded by the JWARS Integrated Product Team (IPT) Draft Proposal [10] for a JWARS Operational Requirements Definition (ORD).

Table 1 provides an abbreviated summary of the recommended toolset resulting from this study. The OOTW tools are listed within five groups: Warnings and Impact Analysis Tools, an Integrated Mission Planning Tool, Support Tools, Cost Models, and Information Tools. Some of the tools show breakdowns where the recommendations differ by functionality. The recommended control authority is shown for each of the lowest level breakdowns, selected from the following choices: Joint M&S, JWARS, and User. A brief rationale, extracted from the body of the report, is included. The priority numbering scheme (1 = critical need,

3 = important need, 5 = enhancement (all needs ranked less important than 3 have been dropped)) and the individual values flow from the user workshops conducted by USPACOM and validated by the attending organizations (the Combatant Commands, the Services, OSD/PA&E, and J-8).

Table 1. Recommended Toolset

OOTW Tool	Candidates	Authority	Rationale	Priority
WARNINGS AND IMPACT ANALYSIS TOOLS				
Real-Time Indicators and Warnings		Joint M&S	Common need, linked to GCCS	1
Impact Simulation				
Peace Operations, HA/DR, National Integrity operations	DEXES/CAM, SPECTRUM	Joint M&S	Common need for research	1
Military contingency operations	JWARS	JWARS	Included in ORD	1
Resource Simulation	JWARS	JWARS	Included in ORD	1
INTEGRATED MISSION PLANNING TOOL				
Mission Definition Decision Support Tool		Joint M&S	Common need	2
Task Analysis Support Tool	GCMP	Joint M&S	Common need	1
Force Design Tool	CAPS, JEB	Joint M&S	Common need	1
Logistics Analysis Tool	FAST-OR	Joint M&S	Common need	1
Transport Analysis Tool				
Execution Planning	JFAST	Joint M&S	Common need	1
Other	JWARS	JWARS		1
SUPPORT TOOLS				
COA Comparitor	DPL	User	Available as COTS	1
MOE Calculator	VSS	Joint M&S	Common need	3
Communications Analysis Tool		Joint M&S	Common need	3
Disaster and Other Specialized Impact Models	CMS, various	Joint M&S	Common support	3
COST MODELS		Joint M&S	Common need	3
INFORMATION TOOLS				
Situation Display	Anchor Desk	Joint M&S	Common need, linked to GCCS	2
Data Warehouse	JDS	JWARS	Common need for data and access	1

Some of the necessary OOTW analytic tools differ in type from JWARS, being driven by real-time planning needs, and have no meaningful intersection with JWARS. However, the simulation-based tools can be related to JWARS (see Fig. 2). JWARS is shown spanning the scale dimension from Special Operations Force (SOF) actions to Major Theater Wars (MTWs) and including combat, transport, logistics, and data activities. OOTW is shown as spanning the scale dimension from SOF to Small Scale Contingencies (SSCs) within the combat activity, but including very little combat (or combat-like) activities at the larger scales. Significantly, OOTW also includes political, economic and social activities as a substantial portion of its activities (with elements in the global and MTW scale).

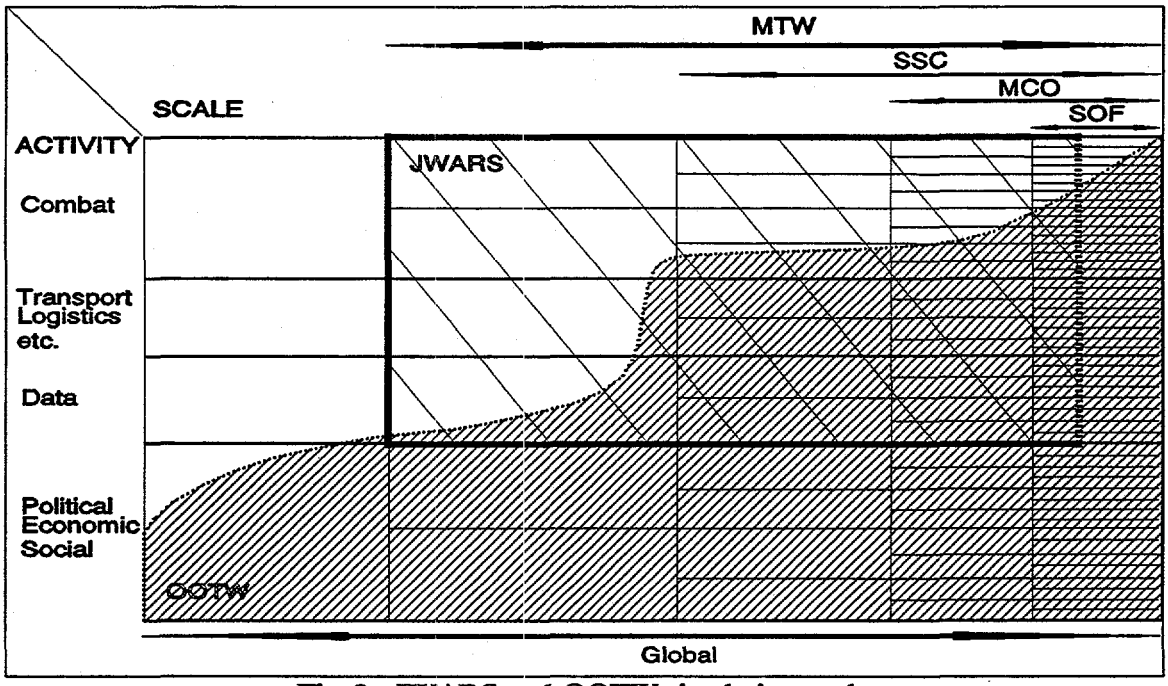

Fig. 2. JWARS and OOTW simulation tools.

This figure replicates five of the broad recommendations in the body of the report:

- OOTW-originated Military Contingency Operations (MCOs), including SOF, should be modeled in JWARS (subject to scale considerations);
- Peace Operations (PO), Humanitarian Assistance/Disaster Relief (HA/DR), and National Integrity (NI) operations should be modeled in JWARS when (or if) they transition to combat SSCs;
- JWARS should model the resource consumption and sequestration activities (transportation, logistics, etc.) of all OOTWs (subject to scale considerations);
- the JWARS Joint Data Support (JDS) should include OOTW data needs; and
- an OOTW impact analysis simulation should (for the time being) be included in research simulations external to JWARS.

Four additional recommendations are independent of the simulation domain:

- an integrated mission planning tool for OOTWs is needed, can be created with a concerted effort, and should be developed promptly;
- an overview or meta-tool is needed to connect the crisis action team to the existing set of disaster analysis tools;
- no additional action is currently required in acquiring cost tools, as this action is underway; and
- the definition for the situation display tool should evolve with the definitions of the other tools that create information to be displayed.

Fig. 3 adds a pictorial representation of all of the recommendations. Within these recommendations, joint M&S support or control may be supplied by the Analysis Council, the Joint Analytic Model Improvement Program (JAMIP), or the Modern Aids to Planning Program (MAPP), as appropriate.

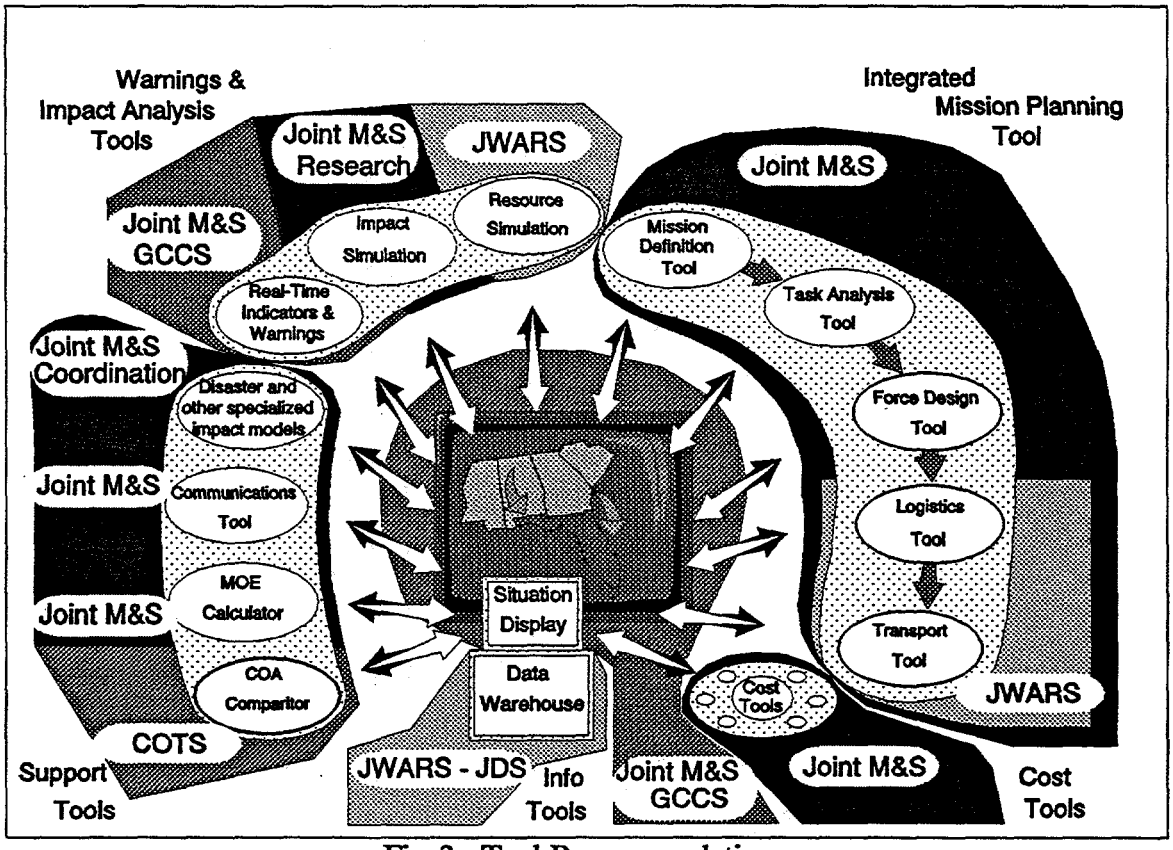

Fig. 3. Tool Recommendations.

Most of the tool categories in Fig. 3 can be created with only modest funding support in a reasonably short time (modest compared with the effort to create JWARS). Doing so would

be a wise investment of resources. As shown in Table 3, the bulk of the recommendations of this report require concerted, coordinated joint M&S support for the creation of tools to meet the OOTW analysis requirements. Two of the tools (and parts of two others) can be directly provided by JWARS. One tool can be acquired as a COTS product. Most of the other tools require only concerted, jointly directed efforts. However, impact simulation is the critical facility for concept and doctrine development and analysis, for systems effectiveness and trade-off analysis, and for force assessment. It is also critical for valid assessments in the execution planning phase of crisis action planning. Each of these areas requires a tool that exposes any difference in results from the use of different concepts of employment, doctrines, force structures, or availability of systems. The impact of the differences in input must be affected by the relevant environment, in the case of OOTW - the environment of political, economic, physical, medical, agricultural, and military interactions. Research is required to determine how to model these interactions. JWARS will not contain this functionality and a separate impact simulation tool will be required. Thus, questions concerning the overall value or impact (beyond consumption of or competition for resources and sufficiency for any potential combat operations) of an operation depend on connections to the politico-economic-social environment and must be addressed by an impact simulation or assessment tool.

Analysis in an OOTW context is proceeding now, without the tools described here. The Commanders in Chief (CINCs) of the Combatant Commands together plan for the estimated 40 - 50 OOTWs that take place each year [9], and for an unknown number of OOTWs that are averted or not responded to by the United States. Further, the importance of OOTW analysis at the long-term planning and programming level is evidenced by the large plurality of OOTW vignettes that were included in the recent Quadrennial Defense Review (QDR). Currently there are two credible MTW scenarios; however, one or both of these involve the possibility of a collapse of the potential aggressor state, with a resulting failed-state OOTW scenario. Should this occur, military analysts would face a potentially long period (before the rise of an alternate aggressor state) in which not only would the majority of actual operations be of an OOTW type, but also the only credible scenarios would be OOTWs.

Prudence dictates the creation of dedicated tools for the immediate support of OOTW analysis. Appendix A of this report presents plans for creating detailed specifications for these tools. Prudence also dictates that JWARS should contain the "hooks" necessary to add additional OOTW functionality in the future with minimal cost. Clearly, U.S. analysts can "make do" without the OOTW analysis tools defined in this report; however, they have strongly asserted [9] and [15] that their analyses can be produced more quickly with the aid of these tools and that the results will be more reliable.

ACRONYMS AND ABBREVIATIONS

AALPS	Automated Air Load Planning System
ACAAM	Air Courses of Action Assessment Model
AD	Anchor Desk
AGIS	Analysis & Gaming Information System
AHP	Analytical Hierarchy Process
ALADUN	Africa and Latin America Database, Unclassified
ALP	Advanced Logistics Planning
AMP	Analysis Mobility Platform
AOR	Area of Responsibility
APOE	Air Port of Embarkation
APSO	Aggravated Peace Support Operations
ARD	Associates in Rural Development
AS	Auto Summarizer
ASAP	All Hazards Situation Assessment Program
AVI	Assessing Vulnerability to Instability
C^3I	Command, Control, Communications, and Intelligence
C3I-NAM	C^3I-Network Assessment Model
C^4ISR	Command, Control, Communications, Computers, and Intelligence Surveillance and Reconnaissance
CAA	Concepts Analysis Agency
CABLE	C3I Application Building Environment
CALMS	Computer Aided Load Manifest System
CANTELOUPES	Cost Analysis Tool to Estimate Light Operations & Unfunded Peacekeeping Scenarios
CAPS	Contingency Analysis Planning System
CATS	Consequence Assessment Tool Set
CD	Counterdrug
CI	Counterinsurgency
CINC	Commander in Chief
CJCS	Chairman Joint Chiefs of Staff
CMASS	Counterdrug Modeling and Simulation System
CMO	Civil-Military Operations
CMPO	Conceptual Model of Peace Operations
CMS	Crisis Management System
COA	Course of Action
COMPASS	Common Operational Modeling, Planning and Simulation Strategy
CONPLAN	Concept Plan
CORBA	Common Object Request Broker Architecture
COTS	Commercial Off-the-Shelf
CT	Combatting Terrorism
DARPA	Defense Advanced Research Projects Agency

DART	Dynamic Analysis and Replanning Tool
DEXES/CAM	Deployable Exercise Support (system)/ Civil Affairs Module
DIAD	Disaster Relief Anchor Desk
DLA	Defense Logistics Agency
DNBI	Disease Non-Battle Injury
DoD	Department of Defense
DPL	Decision Programming Language™
DR	Disaster Relief
DSRD	Data Systems Research and Development Program
DSWA	Defense Special Weapons Agency
ELIST	Enhanced Logistics Intratheater Support Tool
ET	Exercise Template
FAR	Field Anomaly Relaxation
FAST-OR	Force Analysis Spreadsheet Tool - Operations Other Than War Requirements
FDE	Force Deployment Estimator
FEMA	Federal Emergency Management Agency
FEWS	Famine Early Warning System
FID	Foreign Internal Defense or Force Identification Defense
FOC	Full Operating Capability
FON	Freedom of Navigation
FRPPO	Force Requirements Planner for Peace Operations
FTLM-STOCHWARS	Future Theater Level Model - Stochastic Wars
GCAM	Global Crisis Analysis Model
GCCS	Global Command and Control System
GCCS AD	GCCS Anchor Desk
GCMP	Graphic Crisis Management Plan
GDAS	Global Deployment Analysis System
GDSS	Global Decision Support System
GEDS	Global Events Data System
GEOWARN	Global Emergency Warning and Relief Network
GT	Grey Team
GTN	Global Transportation Network
HA	Humanitarian Assistance
HART	Humanitarian Assistance Requirements Tool
HAST	Humanitarian Assistance Survey Team
HDDST	Humanitarian Demining Decision Support Tool
HEAT	Headquarters Effectiveness Assessment Tool
HEWS	Humanitarian Early Warning System
HLA	High Level Architecture
ID	Identification
IOC	Initial Operating Capability
IPT	Integrated Product Team
ISR	Intelligence, Surveillance, Reconnaissance
JAMIP	Joint Analytic Model Improvement Program
JCM	Joint Conflict Model
JCS	Joint Chiefs of Staff
JDS	Joint Data Support

JEB	Joint Electronic Battlebook
JFACC	Joint Force Air Combat Commander
JFAST	Joint Flow and Analysis System for Transportation
JMETL	Joint Mission Essential Task List
JOA	Joint Operations Area
JOPES	Joint Operations Planning and Execution System
JPT	JFACC Planning Tool
JS	Joint Staff
JSCP	Joint Strategic Capabilities Plan
JSORTS	Joint Status of Readiness and Training System
JWARS	Joint Warfare System
JTAV	Joint Total Asset Visibility
JTF	Joint Task Force
KEDS	Kansas Events Data System
LCRS	Low Intensity Conflict Capabilities Requirements System
LIC	Low Intensity Conflict
LICSTA	Low Intensity Conflict Strategies-to-Task Analysis
LOC	Line of Communication
LOG AD	Logistics Anchor Desk
LOGGEN	Logistics Generator
LOTS	Logistics Over the Shore
M&S	Modeling and Simulation
MAPP	Modern Aids to Planning Program
MCO	Military Contingency Operations
MEM	Mission Effectiveness Model
METT-T	Mission, Enemy, Troops, Terrain/Weather and Time Available
MIDAS	Model for Intertheater Deployment by Air and Sea
MIO	Maritime Intercept Operations
MOE	Measure of Effectiveness
MOP	Measure of Performance
MORS	Military Operations Research Society
MRM	Mission Requirements Module
MSCA	Military Support to (Domestic) Civil Authorities
MTMCTEA	Military Traffic Management Command Transportation Engineering Agency
MTW	Major Theater War
NAP	Normality Analysis Process
NCA	National Command Authority
NEO	Noncombatant Evacuation Operation
NGO	Non-Governmental Organization
NHRC	Naval Health Research Center
NI	National Integrity
NSC	National Simulation Center
NSS	Naval Simulation System
OFP	Objective Force Planner
OOTW	Operations Other Than War
OP	Operational
OPLAN	Operations Plan

OPORD	Operations Order
ORD	Operational Requirements Definition
OSD	Office of the Secretary of Defense
PA&E	Program Analysis & Evaluation
PANDA	Program for the Assessment of Nonviolent Direct Action
PATH	Pathgames
PC	Personal Computer
PE	Peace Enforcement
PERICLES	Political/Economic Risk In Countries and Lands Evaluation
PK	Peacekeeping
PO	Peace Operations
PORTSIM	Port Simulation
PRM	Power Relationship Matrix
PSYOP	Psychological Operation
PVO	Private Volunteer Organization
QDR	Quadrennial Defense Review
RCDM	Regional Counterdrug Model
RDSS	Regional Development Simulation System
ROE	Rules of Engagement
RSSIA	Regional Security Strategy Implementation Analysis
sa	Statistical analysis packages
SAM	Surface to Air Missile
SAR	Search and Rescue
sd	System Dynamics
SEES	Security Exercise Evaluation System
SIAM	Situational Influence Assessment Module
SFP	State Failure Project
SN	Strategic National
SOCBAM	Special Operations Cost Benefit Analysis Model
SOF	Special Operations Forces
SPOD	Sea Port of Debarkation
SPOE	Sea Port of Embarkation
sprd	Spreadsheets
SSC	Small Scale Contingency
ST	Strategic Theater
STRICOM	Simulation Training and Instrumentation Command
sw	Seminar Wargames
TARGET	Theater Analysis and Replanning Graphical Execution Toolkit
TPFDD	Time Phased Force Deployment Dataset
TRANSCOM	Transportation Command
TSPS	Theater Security Planning System
UCCATS	Urban Combat Computer Assisted Training System
UJTL	Universal Joint Task List
USACOM	US Atlantic Command
USCENTCOM	US Central Command
USEUCOM	US European Command
USPACOM	US Pacific Command
USSOCOM	US Special Operations Command

USSOUTHCOM	US Southern Command
VSS	Valuated State Space
WPS	Worldwide Port System

1. INTRODUCTION

The past several years have seen an increasing recognition of the need for analysis tools to support planning and execution of military Operations Other Than War (OOTWs). (The term Small Scale Contingency (SSC) appears to be replacing OOTW; however, to avoid confusion, OOTW will be used here.) Analysis tools to support decision-making for large-scale military operations (such as major theater wars (MTWs)) are relatively mature. In contrast, OOTW analysis tools are embryonic or non-existent. Because the U.S. military involvement in OOTWs is expected to be increasingly frequent during the post-Cold-War era, various authorities have argued that development of OOTW analysis tools should receive higher priority than continued enhancement of analysis tools for large-scale military operations. At the same time, however, it has become clear that the current large-scale combat models are inadequate in their portrayal of joint operations and command, control, communications, intelligence, surveillance, and reconnaissance (C^4ISR). Therefore, Department of Defense (DoD) has begun the creation of a new large-scale combat model, the Joint Warfare Simulation (JWARS).

1.1 PURPOSE

The work described in this document was sponsored by the Office of the Secretary of Defense/Program Analysis & Evaluation (OSD/PA&E) and focused on analytic tools. Tools are the analysts' force multipliers. They extend the analysts' reach, vision, and memory and they save time. Tools are not substitutes for analysis - properly used, they are supports to that analysis. This work assumed that there were valid requirements for tools (next section) and developed means for obtaining them. This work involved three tasks:

- clarify what aspects of the OOTW mission are modelable with the JWARS theater level combat focus and resource constraints;
- define the remaining OOTW analytical support requirements; and
- recommend actions to meet the OOTW analytical support requirements.

The remainder of Section 1 describes how the OOTW analytic tool requirements were defined and how these requirements relate (in general) to JWARS. Section 2 describes the OOTW analysis requirements as they relate to the various categories of analysis. Section 3 identifies realizable tools that are capable of supporting the analysis processes, ties them to the Universal Joint Task List (UJTL), and recommends the appropriate method for obtaining each tool. Section 4 draws conclusions about the future directions of analytical support. Four appendices are included: the first provides more details on creating the detailed tool specifications; the second gathers the UJTL vs tool connections into a convenient reference table; the third provides information on current tools with the potential to support OOTW analyses; and the fourth provides a crosswalk of the analysis procedures and the OOTW analysis tasks.

1.2 OOTW REQUIREMENTS DEVELOPMENT

The US Pacific Command (USPACOM) instituted a project to define the requirements for analysis tools to support OOTWs. These requirements would then influence the development of OOTW analysis capabilities within JWARS, which is being developed under the sponsorship of OSD/PA&E. Because the original JWARS Requirements Document [11] specified only limited OOTW analysis capabilities, the project would also identify opportunities for developing interim OOTW analysis capabilities, including exploratory tools for possible federation with JWARS. Department of Defense organizational participants and reviewers of the USPACOM project are shown in Table 2.

Table 2. DoD Reviewing Organizations

US Atlantic Command (USACOM)
US Central Command (USCENTCOM)
US European Command (USEUCOM)
US Pacific Command (USPACOM)
US Special Operations Command (USSOCOM)
US Southern Command (USSOUTHCOM)
Office of the Secretary of Defense/Program Analysis and Evaluation (OSD/PA&E)
The Joint Staff/J-8
US Air Force
US Army
US Marine Corps
US Navy

Fig. 4 capsulizes the sequence of events over the duration of the USPACOM project. The first workshop was held at the Naval Postgraduate School in Monterey in February 1996. This workshop was attended by representatives of the Office of the Secretary of Defense, the Joint Staff, the Unified Commands, the Services, and numerous other organizations. This author wrote a draft document based on that workshop, other conferences on OOTWs, and research of the literature on OOTWs. The second Monterey workshop was held in September 1996 to review and extend the draft document. This workshop identified and categorized the many types of operations that can be considered operations other than war; examined the attributes of different kinds of OOTWs; and identified similarities and differences of U.S. military tasks that must be performed in OOTWs. The draft document was refined, creating a second draft, and USPACOM circulated the result to the Commanders in Chief (CINCs), the Services, OSD, and The Joint Staff/J-8.

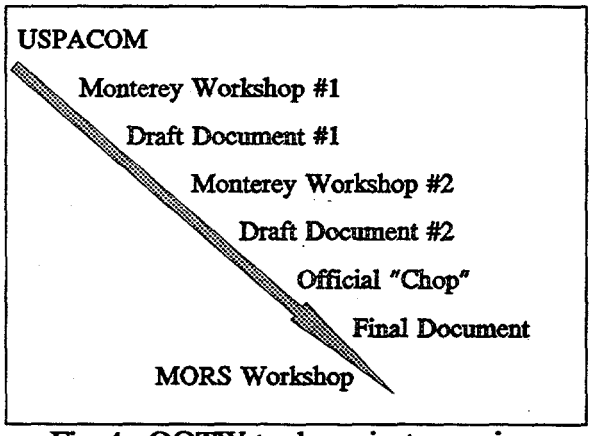

Fig. 4. OOTW tools project overview.

The USPACOM OOTW Tools Project identified 10 requirements for analysis tools (Table 3). Each requirement is described in terms of functions needed to satisfy the requirement, the users that the requirement supports, the requirement's priority (1 = critical need, 3 = important need, 5 = enhancement, with 4s and 5s dropped), and the recommended action.

Table 3. OOTW Analytical Tool Requirements
from [9]

Rqmt	Title	Description	Use	P	Act
1	**Situational Awareness**	supports the generation of a complete picture of the current and likely future situation	NCA CINC JTF Service	2	start now
2	**Impact Analysis**	supports the analysis of the impact of human actions (own-side, opposition or neutral parties) on the current situation and on future plans	NCA CINC JTF Service	1	R&D
3	**Mission Definition & Analysis**	supports mission definition in its broadest sense	NCA CINC JTF	2	do now
4	**Force Planning: Design Forces**	supports the design of supporting and supported forces for use in OOTWs, where the supported forces may consist of forces that belong in the supporting category in combat operations - both parts may include U.S. non-military and non-U.S. elements	CINC Service	1	do now
5	**Force Planning: Deployment Scheduling**	supports the timing and prioritization of deployment scheduling, including U.S. non-military and non-U.S. elements	CINC	1	do now
6	**COA Development, Analysis, Comparison**	supports Course of Action (COA) development, analysis, comparison, estimates of success and casualty predictions, risk modeling, and recommendations	CINC JTF	1	R&D
7	**Transition Planning and Tracking of Operational Data**	supports continued planning of the transition and tracking of MOEs, MOPs, end-state and transition criteria, and analysis of such things as casualties and medical treatments	CINC JTF	3	do now
8	**Communication Analysis**	supports communications analysis, including interoperability of non-U.S. and non-military equipment	CINC JTF	3	R&D
9	**Cost Analysis**	models costs of generic OOTWs for use in national force structure planning, input to decisions on engaging in an OOTW, and to estimate comparative costs during mission planning	NCA CINC JTF Service	3	do now
10	**Information Availability and Analysis**	supports data collection and analysis and use by other tools	NCA CINC JTF Service	1	do now

The requirements support multiple functions, within the time and level of authority divisions shown in Fig. 5, where the requirement number is shown beside the oval containing the

requirement name and the major connections among the requirements are indicated with arrows [9]. Further insight into the required tools was gained through a Military Operations Research Society (MORS) workshop [15].

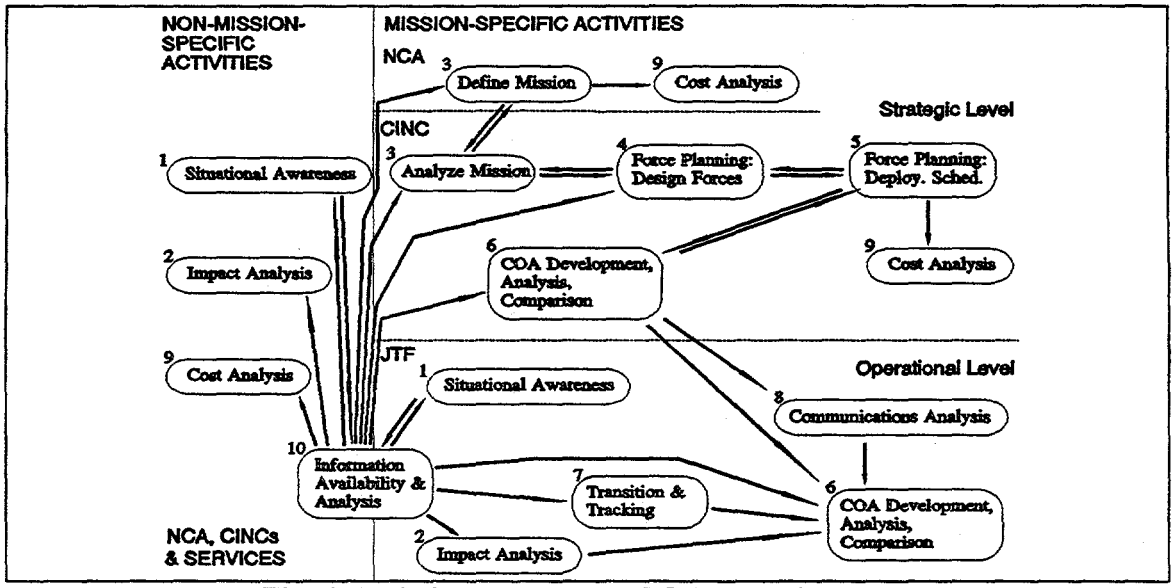

Fig. 5. Relations among the OOTW requirements.

1.3 OOTW AND JWARS

OSD/PA&E continued the project with an effort to identify how the OOTW requirements relate to the JWARS framework. Fig. 6 shows the JWARS model and its data sources, contained within the Joint Analytic Model Improvement Program (JAMIP), supported by the High Level Architecture (HLA) and Configuration Management. It also shows the relationship of the analytic tool needs for OOTW and JWARS/JAMIP. Some OOTW Modeling and Simulation (M&S) needs may be supported by JWARS. Some OOTW analytic tool needs may be specific to only parts of the community and some may be common to the general analytic community, but not within the purview of JAMIP. Some of the OOTW analytic requirements may be shared by the Global Command and Control System (GCCS). The figure also indicates that there are some M&S needs that require research before valid models can be created and that these needs may (or may not) be supported by the joint community.

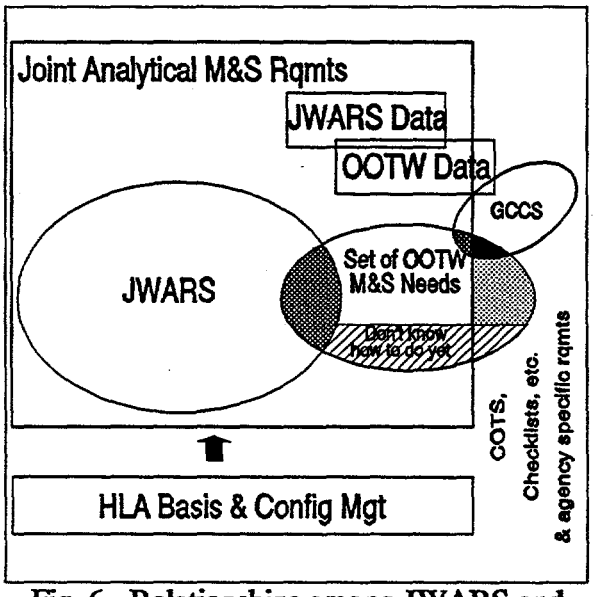

Fig. 6. Relationships among JWARS and OOTW requirements.

1.3.1 Process

Three efforts were ongoing simultaneously. The first was the work reported in this document. The second was a task by CACI, Inc., under their JWARS contract, which investigated the technical ability to model OOTW functionality within JWARS (see Fig. 7 from [2]). The third effort was the Operational Requirements Definition (ORD) process, which identified the functionality in the OOTW domain to be included in JWARS [10], i.e., the intersection, as shown in Fig. 6.

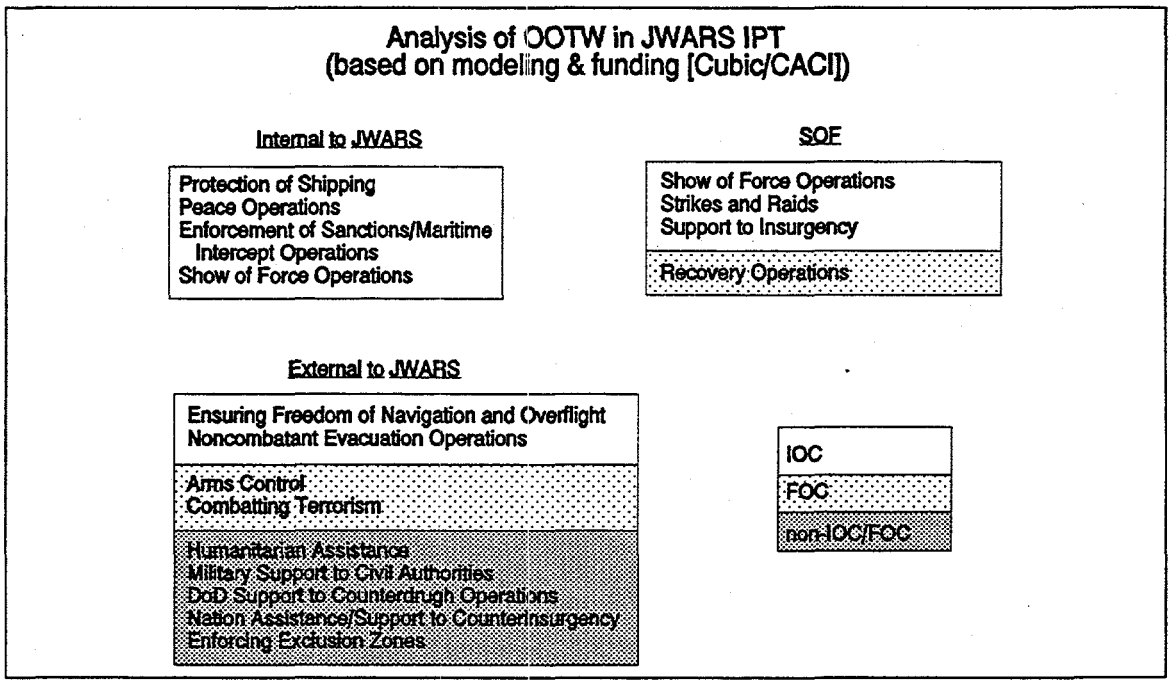

Fig. 7. Preliminary results of CACI work.

As shown in Fig. 8, the work reported here is based on the preceding efforts and produces actionable recommendations. The first USPACOM workshop identified the process of and drivers (questions) for OOTW analysis. The second USPACOM workshop identified the OOTW analysis structure and the requirements for analysis tools. The MORS workshop explored the functional areas and surfaced potential methodologies and tools. The OSD/J-8 conference examined the question of the coverage of OOTW issues by JWARS. At the MORS Symposium, the decision was made to continue the investigation of OOTW analysis tool requirements. The final step shown in Fig. 8, the OSD study, refers to the work reported in this document, which concludes with recommendations for implementation of the needed tools.

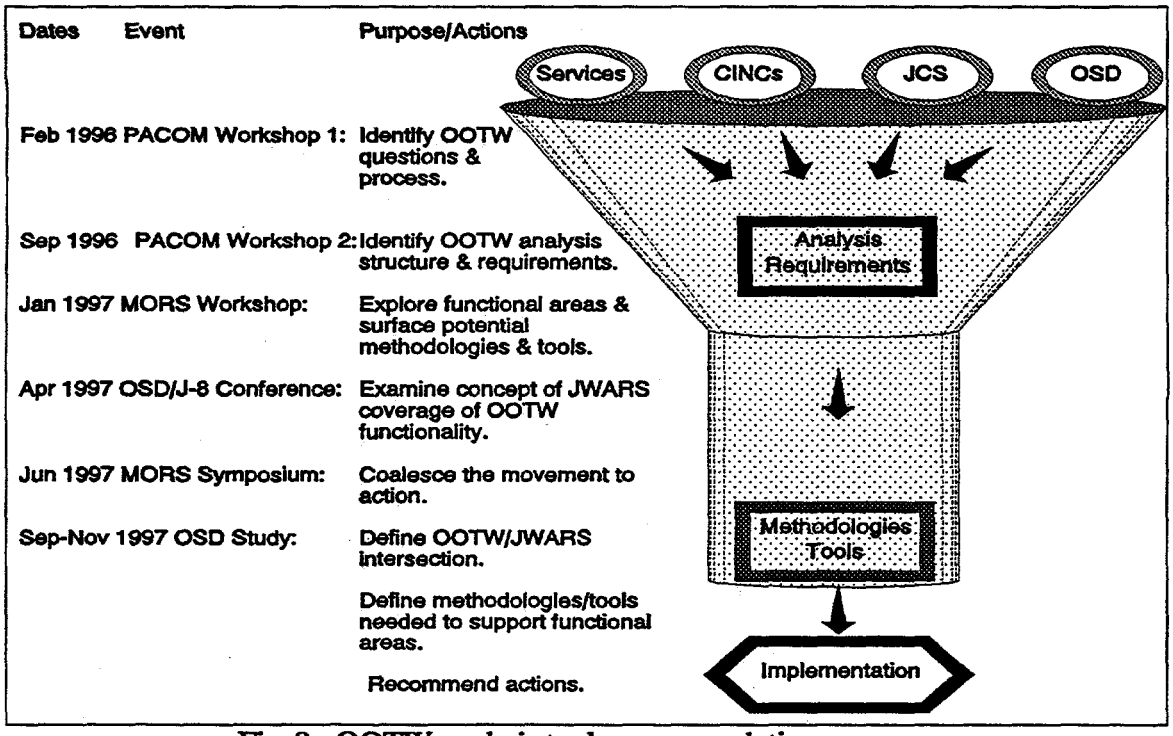

Fig. 8. OOTW analysis tool recommendations process.

1.3.2 Inclusion of OOTW Functionality in JWARS

In Fig. 9, JWARS is shown spanning the scale dimension from Special Operations Force (SOF) actions to Major Theater Wars (MTWs) and includes combat, transport, logistics, and data activities. OOTW is shown as spanning the scale dimension from SOF to Small Scale Contingencies (SSCs), but including very little combat (or combat-like) activities at the larger scales. Significantly, OOTW also includes political, economic and social activities as a substantial portion of its scope (with elements in the global and MTW scale). An aid to deciding how OOTW can be included in JWARS, and hence which tool requirements can be met within JWARS, is to consider possible uses for JWARS in an OOTW context and determine whether such a use makes sense. Three examples are provided.

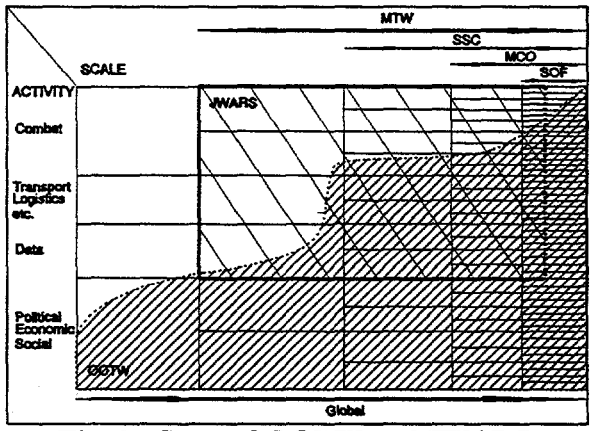

Fig. 9. Span of OOTW and JWARS.

The first example addresses questions at the function level. In this example, a direct action mission is envisioned, with ingress, target accomplishment, and egress (shown in Fig. 10). Modeling the mission elements and their probabilities of success is not difficult; however,

connecting the results to the overall context is more problematic. If the context is a military contingency operation (MCO) mission within a war, the question involves connecting a very fine level resolution action to combat Measures of Effectiveness (MOEs) at a grosser level of resolution. However, if the context is an MCO within an OOTW, further complications arise: JWARS would have to model the larger political, economic, and sociological environment to which the results must be connected and the scientific understanding would have to exist to make those connections.

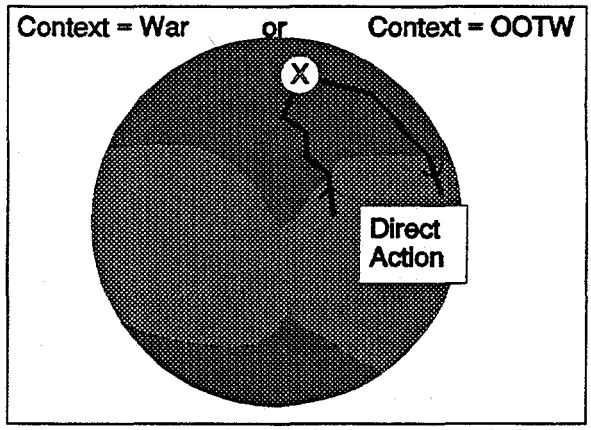

Fig. 10. Modeling a direct action mission.

The second example revolves around the potential need for dynamic computation of the competition for resources that multiple simultaneous operations will entail. In Fig. 11, the simultaneous operations consist of an MTW and an Humanitarian Assistance/Disaster Relief (HA/DR), which, though separated geographically, compete for some of the same resources. Differing situations could require differing answers as to how JWARS should be involved. Some situations might require only an analysis of the HA/DR prior to the JWARS simulation of the MTW, with the results being used to modify the input stream to JWARS. In other situations, the definition of which resources were needed in both operations (and which were needed in only one operation) might vary over time and with the progress of the MTW. In these situations, simultaneous simulation of both operations might be advantageous.

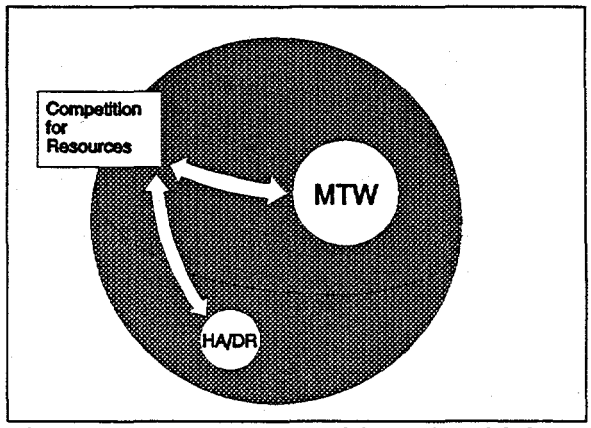

Fig. 11. Resource competition of multiple operations.

The third example involves the fact that situations may change. This example, shown in Fig. 12, postulates a peacekeeping (PK) operation that, for whatever reason, transitions to a combat-based SSC and then to an MTW. Clearly, JWARS must simulate the resulting MTW. JWARS must also simulate the SSC. However, it is not clear whether JWARS should be capable of simulating the transition from an SSC to an MTW, nor whether it should be capable of simulating the transition from a PK to an SSC. To make the example more concrete, one

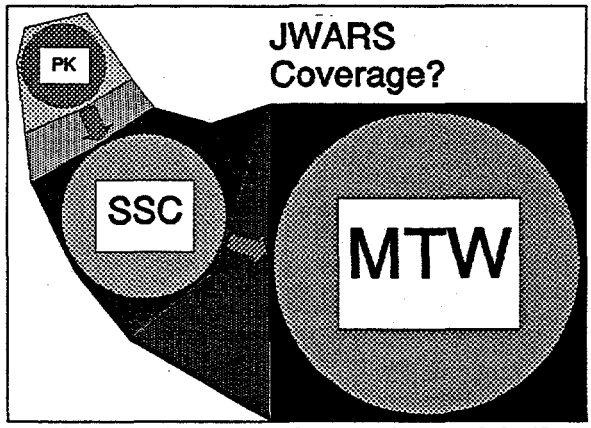

Fig. 12. Are transitions to be modeled?

might consider under what conditions JWARS should simulate operations in Bosnia. For example, the prototype includes an attack on withdrawing forces, without simulating the causes of the attack. Other possibilities can be envisioned.

From these and other examples, three precepts can be evolved:

1. If combat or near-combat MOEs predominate in the OOTW study question, then JWARS will support OOTW functionality as long as the level of detail required for the OOTW functions is compatible with the general nature of JWARS. **JWARS provides OOTW Combat Simulation.**

2. If non-combat MOEs predominate, but only at the very highest level (evaluation of the overall result relies on non-combat MOEs, but decisions during the course of the simulation can be made using combat or near-combat MOEs in all but a small number of instances, permitting manual intervention), then JWARS will support OOTW functionality as long as the level of detail is reasonable. **JWARS provides OOTW Resource Simulation.**

3. If non-combat MOEs are required to determine most decisions during the course of the simulation, then JWARS will not support OOTW functionality. **JWARS does not provide OOTW Impact Simulation.**

1.3.3 OOTW Analytic Support as a Joint Responsibility

For valid OOTW analytical support requirements, there are two alternatives to the provision of support by JWARS: individual user development and joint community development external to JWARS. The criteria for joint, non-JWARS support for creation of a tool, as opposed to individual user funding and development, consist of either a joint community need or a need for the tool to interface with other common tools. Where the joint need can be specified in detail, duplication of procurement is unjustified. Where the specifications of the need are not easily definable, multiple prototypes may be beneficial. Where a tool must interface with other common tools, joint support is needed to ensure continual usability through common configuration management. Requirements that fail these criteria will be left to individual users to fill.

2. OOTW ANALYTIC PROCEDURES AND FUNCTIONS

The requirements for OOTW tools have been identified [9] and amplified [15] previously. However, they were defined in the OOTW environment and need to be restated within the JWARS environment. Section 2.1 begins the process by linking the OOTW requirements to JWARS concepts. The remaining subsections of Section 2 continue the process by defining OOTW analytic procedures. Section 3 identifies individual tools that can support the needed procedures and places these tools within the JWARS environment.

2.1 LINKING OOTW TOOL REQUIREMENTS TO JWARS CONCEPTS

Because current combat simulations are unbalanced in their treatment of joint forces and because they are inadequate to discriminate among C^4ISR systems effects, JWARS is being created as the new general use theater-level combat simulation. JWARS will support four analysis needs [10]:

> Planning and execution analysis (both crisis action planning and deliberate planning),
> Force assessment,
> System effectiveness and trade-off analysis, and
> Concept and doctrine development and analysis.

Planning and execution analysis is performed principally by the CINCs, with participation by the Joint Staff and OSD and the other military communities, and supports the creation of plans for potential and actual use of U.S. military forces. This category is divided into crisis action planning and deliberate planning. Joint Publication 5-0 describes the elements of each planning processes.

Force assessment is led principally by the Joint Staff, with strong participation by the Services, using potential crisis situations and associated Operations Plans (OPLANs), Concept Plans (CONPLANs), functional plans, or notional plans. The activities of the force are simulated under various conditions and the results are used in judging the adequacy of the force to meet U.S. needs.

System effectiveness and trade-off analysis is led principally by OSD, with strong participation by the Services, using potential crisis situations and associated OPLANs, CONPLANs, functional plans, or notional plans. Alternative systems are included in the forces and their activities are simulated under various conditions. The results are used in deciding whether to acquire systems or which combinations of systems best meet U.S. needs.

Concept and doctrine development and analysis is performed principally by the Services, with participation by the Joint Staff in the Joint arena, using potential crisis situations and associated OPLANs, CONPLANs, functional plans, or notional plans. Alternative concepts of employment and employment doctrines are simulated and the results are used in making changes to doctrine.

2.1.1 Planning Procedures

The procedures of Deliberate Planning are summarized from Joint Pub 5-0 [12] in Table 4.

Table 4. Deliberate Planning

Initiation
- CJCS assigns a task to the CINC and apportions forces and resources to the CINC through the JSCP
  - identifies broad scenarios for plan development
  - specifies the type of plan (OPLAN or CONPLAN [with or without TPFDDs] or functional plans)
  - provides additional guidance as necessary
- or the combatant commander initiates process by preparing plans

Concept Development
- Mission Analysis
  - mission statement is deduced
  - subordinate tasks are derived
- Planning Guidance
  - alternative COAs are developed
- Staff Estimates
  - alternative COAs are analyzed for supportability
- Commander's Estimates
  - alternative COAs are wargamed, analyzed and compared
  - preferred COA is selected
- CINC's Concept
  - preferred COA is expanded into the CINC's Strategic Concept
- CJCS Concept Review
  - CJCS reviews and approves

Plan Development
- Force Planning
- Support Planning
- Nuclear Planning
- Transportation Planning
- Shortfall Identification
- Transportation Feasibility Analysis
- TPFDD Refinement
  - computer database
  - requires JOPES
  - transportation oriented
  - contains resupply, cargo and personnel planning data
    - forces refinement done in coordination with supported and supporting commanders, Services, the JS, and other supporting agencies includes combat support and combat service support supplied by the Services. USTRANSCOM provides sealift and airlift estimates
    - logistics refinement is conducted primarily by the Services, the Defense Logistics Agency (DLA) and Service component commanders. USTRANSCOM coordinates on logistic planning matters
    - transportation refinement is provided by USTRANSCOM to determine transportation feasibility
- Documentation

Plan Review
- Review of entire plan in all respects

Supporting Plans
- Developed by component commanders, subordinate joint force commanders, supporting commanders, and other agencies
- Plans focus on mobilization, deployment, employment, sustainment, and redeployment of forces and resources
- Supported commander reviews and approves the supporting plans

The procedures of Crisis Action Planning are summarized from Joint Pub 5-0 [12] in Table 5.

Table 5. Crisis Action Planning

Situation Development Focus is on combatant commander of area Detect, Report, and Assess Situation actions being taken forces available expected time for earliest commitment of forces major constraints on the employment of forces
Crisis Assessment Focus is on the NCA, the CJCS and other members of the JCS Decide whether a military option should be prepared If so, may include specific guidance on COAs to be developed If so, will establish command relationships identify the mission identify any planning constraints
COA Development Focus is on the combatant commander Develop and analyze the COAs Reviews results of previous deliberate planning - OPLANs, CONPLANs, and functional plans Supporting commanders, subordinate joint force commanders and component commanders begin TPFDD development (for each COA if time permits) USTRANSCOM reviews the proposed COAs and prepares deployment estimates The Services monitor the development of the COAs and begin planning for support forces, sustainment and mobilization The supported commander analyzes the COAs and submits his recommendations to the NCA and the CJCS
COA Selection Focus is on the NCA The CJCS reviews and evaluates the COAs and prepares recommendation to the NCA The NCA selects a COA
Execution Planning The supported commander develops the OPORD and TPFDD by modifying and existing OPLAN, expanding an existing CONPLAN (with or without TPFDD), or by developing a new plan Supporting commanders identify and task specific units and provide movement requirements Component commanders identify and update sustainment requirements in coordination with the Services USTRANSCOM develops transportation schedules The Services determine mobilization requirements and plan for the provision of nonunit sustainment The Joint Staff monitors the progress, resolve shortfall and review the OPORD for feasibility and adequacy The NCA decides to implement the OPORD
Execution Subordinate and supporting commanders execute their OPORDs The supported commander monitors movements, assesses and reports the achievement of objectives and continues planning as necessary The CJCS monitors the deployment and employment, acts to resolve shortfalls, and directs action to ensure successful termination of the crisis USTRANSCOM manages common-user global air, land, and sea transportation

2.1.2 Linking Planning Procedures to Analysis Procedures

Not all planning procedures require analysis procedures for support and some planning procedures involve multiple analysis procedures. In Tables 6 and 7, the planning procedures listed in Tables 4 and 5 are linked to a set of analysis procedures (to be described following the tables). In addition, the organizational focus for each procedure is carried forward from Tables 4 and 5. These organizations are labeled as follows: National Command Authority (NCA), Joint Staff, CINC, Joint Task Force (JTF), Services, and Others (supporting commanders, subordinate joint force commanders, component commanders, US Transportation Command (USTRANSCOM), Defense Logistics Agency (DLA), and other agencies).

Table 6. Deliberate Planning - Analysis Procedures

Planning Procedures	Analysis Procedures	Focus
Initiation	Predict/Detect Situation Define Situation Define Mission Transition	Joint Staff or CINC
Concept Development		
Mission Analysis	Define Mission Transition	CINC
Planning Guidance	Task Analysis	CINC
Staff Estimates	Force Design	CINC
Commander's Estimates	Task Analysis Force Design	CINC
CJCS Concept Review	Task Analysis Force Design	Joint Staff
Plan Development		
Force Planning	Force Design	CINC
Support Planning	Force Design	CINC
Transportation Planning	Transport Analysis	CINC
Transportation Feasibility Analysis	Transport Analysis	CINC
TPFDD Refinement	Force Design Transport Analysis Logistics Analysis	Others
Plan Review	Task Analysis Force Design	Joint Staff
Supporting Plans		
Mobilization, deployment, employment, sustainment, and redeployment of forces and resources	Transport Analysis Logistics Analysis	Others
Review and approve	Force Design	CINC

Table 7. Crisis Action Planning - Analysis Procedures		
Planning Procedures	Analysis Procedures	Focus
Situation Development	Predict/Detect Situation Define Situation	CINC
Crisis Assessment	Define Situation Define Mission Transition	NCA, Joint Staff
COA Development		
Develop and analyze the COAs	Task Analysis Force Design Transition	CINC
TPFDD development	Force Design	Others
Prepares deployment estimates	Transport Analysis	Others
Planning for support forces, sustainment and mobilization	Force Design Logistics Analysis	Services
COA Selection	Task Analysis Force Design	NCA, Joint Staff
Execution Planning		
Develops the OPORD and TPFDD	Define Mission Force Design Logistics Analysis Transport Analysis	CINC
Identify and task specific units and provide movement requirements	Force Design Transport Analysis	Other
Identify and update sustainment requirements	Logistics Analysis	Other
Develop transportation schedules	Transport Analysis	Other
Determine mobilization requirements and plan for the provision of nonunit sustainment	Transport Analysis Logistics Analysis	Services
Review the OPORD for feasibility and adequacy	Task Analysis Force Design	Joint Staff
Execution		
Execute OPORDs	Mission Evaluation Transition	JTF
Monitor movements, assess and report the achievement of objectives and continue planning	Mission Evaluation Transition Recovery	CINC
Monitor deployment and employment, act to resolve shortfalls, and direct action to ensure success	Mission Evaluation Transition	Joint Staff

The planning procedures for both deliberate planning and crisis action planning are listed above in a linear fashion; however, some procedures may proceed simultaneously with

other procedures. Further, some sets of procedures may actually recur in an iterative manner, as solutions are approximated more and more precisely. Even with this linear exposition, it is clear that there is no linear sequence for the analysis procedures (second column of the tables). However, exposition requires a linear sequence. A reasonably intelligible linearization of the analysis procedures sequence is given as follows:

- predicting or detecting a situation that may lead to an OOTW,
- defining the situation,
- defining the mission,
- performing task analysis,
- designing the forces required,
- performing logistics analysis,
- analyzing the transport requirements,
- evaluating the ongoing mission,
- supporting the transition from military activities, and
- supporting the recovery of personnel and materiel.

2.1.3 Linking Analysis Procedures to OOTW Requirements

Fig. 13 shows the connections for the Crisis Action Planning category between the procedures, the OOTW requirements (with the requirement number taken from Table 3), and the primary and secondary analytical support divisions among OSD, the Joint Staff, the Services, the CINCs, the JTF created for the operation, and the Other organizations (e.g., USTRANSCOM). These connections (and those following) are approximate, not definitive.

Crisis Action Planning	Predict Situation	Define Situation	Define Mission	Task Analysis			Force Design				Logistics Analysis		Transport Analysis	Mission Evaluation			Transition	Recovery		
Action																				
10. Info/data																				
Rqmt	Impact Anal	Sit Aware	Cost Anal	Miss Def/Anal	Cost Anal	FP: Design	COA Anal	Commo Anal	Impact Anal	FP: Design	FP: Sched	Commo Anal	FP: Sched	FP: Sched	Sit Aware	FP: Design	COA Anal	TransPlan/Track	Cost Anal	TransPlan/Track	FP: Design	FP: Sched	Cost Anal
Rqmt #	2	1	9	3	9	4	6	8	2	4	5	8	5	5	1	4	6	7	9	7	4	5	9
OSD			X		X														X				X
Joint Staff		X		X			o		o						o					X			
Services			o							o	o	o	X	o							o	o	o
CINCs	X	X		o		X	X	X	X	X	X	X	o	o	o					o	X	X	
JTF															X	X	X	X		o	o	o	
Other										o	o		X	X							o	o	

X Primary
o Secondary

Fig. 13. Crisis Action Planning analysis support.

Fig. 14 shows the analogous connections for the Deliberate Planning category.

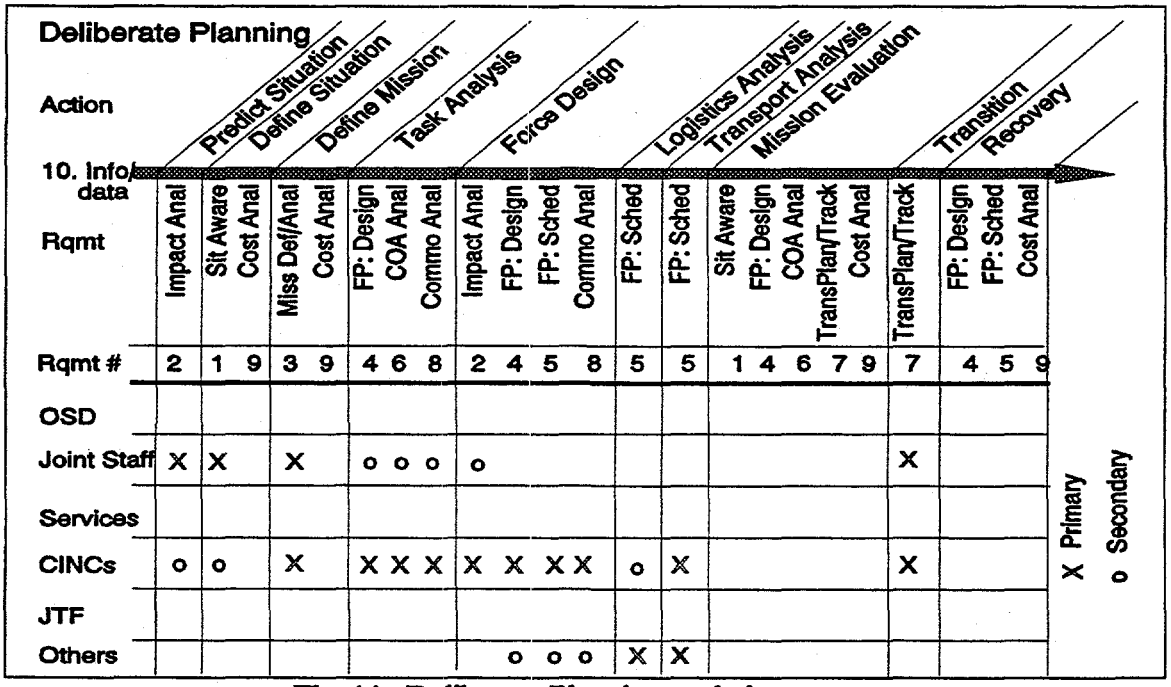

Fig. 14. Deliberate Planning analysis support.

Fig. 15 shows the connections for the Force Assessment category. In Force Assessment (Fig. 15), the Predict Situation and Define Situation procedures are replaced by scenario or vignette development, which is included in the Define Mission procedure.

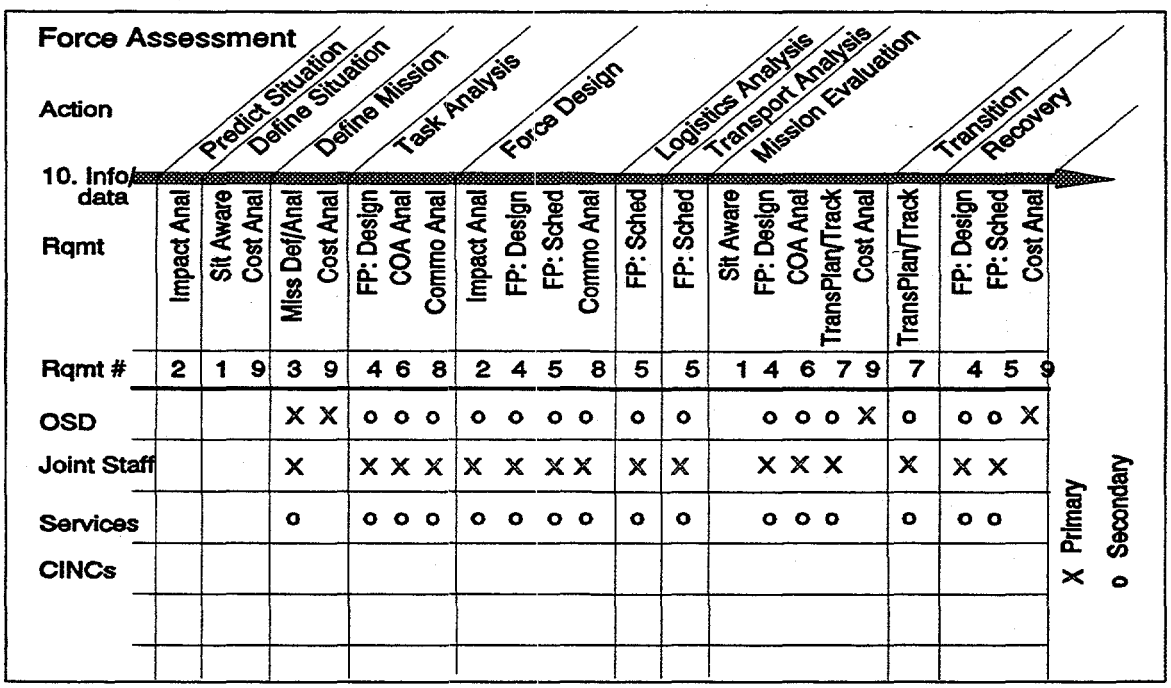

Fig. 15. Force Assessment analysis support.

Fig. 16 shows the connections for the Systems Effectiveness and Trade-Off Analysis category, as in Fig. 15. Similarly, Fig. 17 shows the connections for the Concept and Doctrine Development and Analysis category.

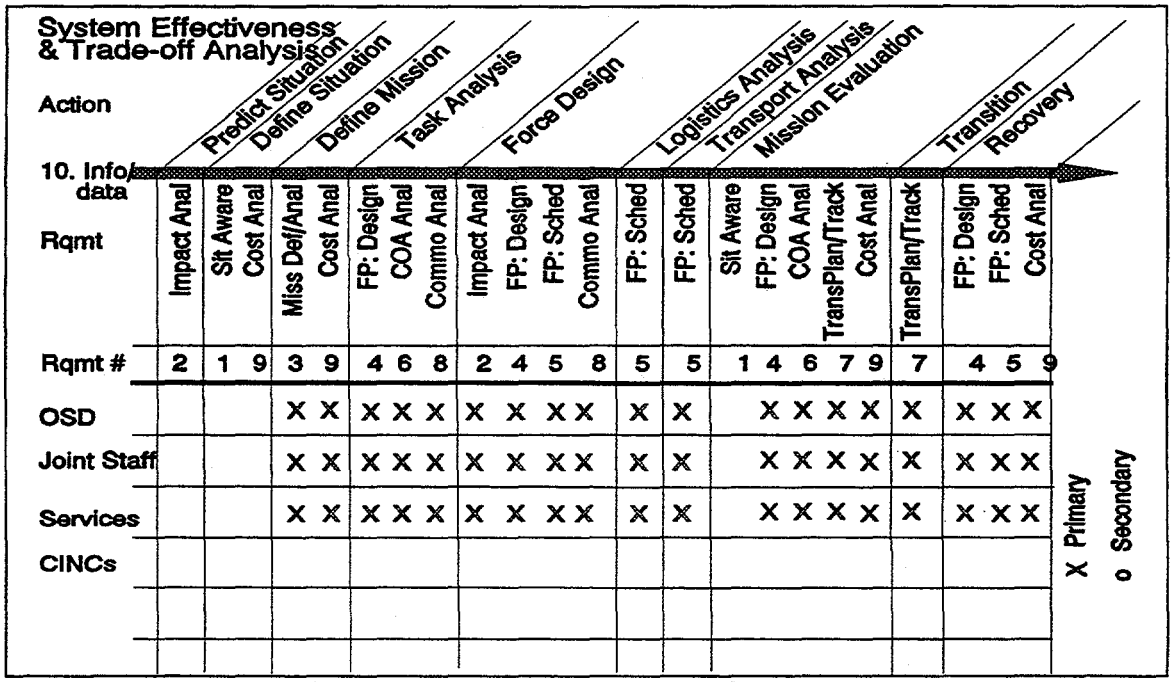

Fig. 16. System Effectiveness and Trade-Off analysis support.

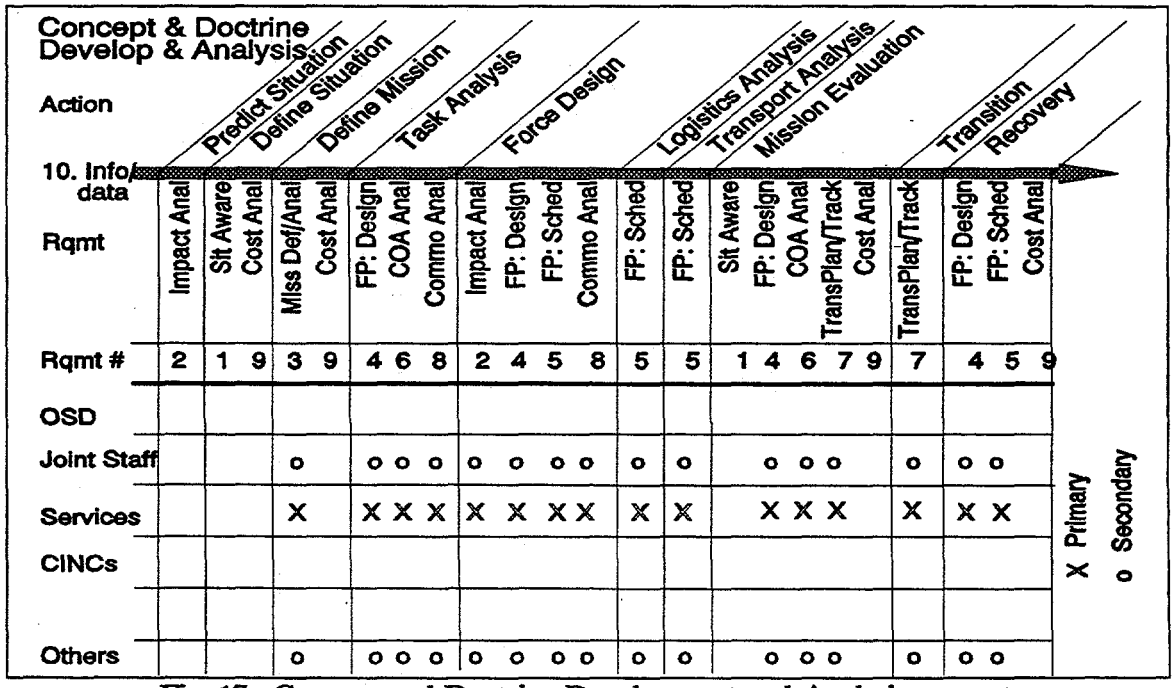

Fig. 17. Concept and Doctrine Development and Analysis support.

To reiterate, the allocation of primary and secondary concerns among the concerned organizations in the prior figures represents an approximation to reality that has not been fully examined by all participants. However, revisions of the details will leave the major concept intact: each category exhibits its own pattern of divisions of concerns.

The remainder of Section 2 describes the analysis procedures in terms of the OOTW tasks. The OOTW tasks are grouped by the applicable OOTW requirements (indicated by the capitalized name and requirement number from Table 3, e.g., "IMPACT ANALYSIS {2}") and followed by a general description of the tasks as they relate to the particular procedure. (A detailed cross-walk is provided in Appendix D.) The information here (Section 2) is a compilation from the requirements document [9] and the MORS Workshop report [15]; whereas, the succeeding sections introduce new insights.

2.2 PREDICT/DETECT SITUATION

The function of this analysis procedure is to predict situations that may lead to OOTWs, including economic, cultural, military, and political factors and acts of nature.

IMPACT ANALYSIS {2}: produce the forecast of the regions of potential instability, the predicted dates, the related probabilities, and the nature of the instabilities; predict results, both desirable and undesirable, of all actions; and support response to media questions.

2.3 DEFINE SITUATION

The function of this analysis procedure is to define the values of all significant parameters of a situation that may require an OOTW.

SITUATION AWARENESS {1}: to permit a complete and accurate evaluation of the mission status, present instability forecasts; readiness of U.S. military forces, U.S. agency elements, and coalition elements; Intelligence, Surveillance, Reconnaissance (ISR) concerning threat, friendly and neutral elements, and environmental information; cultural issues; results of the opposing courses of action (COAs); results of the Mission, Enemy, Troops, Terrain/Weather and Time Available (METT-T) analysis; centers of gravity; "enemy" threat; casualty situation; infrastructure improvement requirements; and indigenous/client/refugee support requirements and location tracking. Present the definition of the situation to permit media and public affairs support.

COST ANALYSIS {9}: provide information on probable incremental costs to support the decision on engaging in a particular OOTW and full costs of a particular OOTW to support the Congressional Budget process.

2.4 DEFINE MISSION

The function of this analysis procedure is to define the overall mission and the U.S. military role.

MISSION DEFINITION AND ANALYSIS {3}: provide a framework for determining the relationships among MOEs, Measures of Performance (MOPs) and mission success; developing appropriate rules of engagement (ROE); determining the desired mission end-state, type of transition and transition criteria; and defining the relationships among the military, government agencies, coalition forces, and Non-Governmental Organizations (NGOs)/ Private Volunteer Organizations (PVOs).

COST ANALYSIS {9}: provide information on incremental costs of notional OOTWs to support the long-term analysis and relative (full) costs to support the selection of the mission plan.

2.5 ANALYZE TASKS

The function of this analysis procedure is to determine the tasks that must be accomplished.

FORCE PLANNING: DESIGNING FORCES {4}: identify tasks in infrastructure improvements; humanitarian operations; engineering support; medical support; joint/ interagency/coalition support; and indigenous/client/refugee support, including location tracking.

COA DEVELOPMENT, ANALYSIS, COMPARISON {6}: identify tasks needed for adequate protection of all forces, including other agencies, coalition forces, and NGO/PVOs; and identify whether tasks involved in the use of force, whether lethal or non-lethal, are required.

COMMUNICATIONS ANALYSIS {8}: identify the tasks needed for communications, including non-standard communications with other government agencies, coalition forces, host government, and NGOs/PVOs.

2.6 DESIGN FORCE

The function of this analysis procedure is to determine and designate the U.S. forces required for the operation and to account for allied forces and non-governmental organizations.

IMPACT ANALYSIS {2}: gather and codify the cultural issues; identify proper procedures with respect to cultural issues; provide a framework for the METT-T analysis; answer "what-if" questions; and identify necessary materiel, human resources and procedures.

FORCE PLANNING: DESIGNING FORCES {4}: identify human resources, materiel and procedures. The domains are heavy vs light forces and weapons mix plus forces needed to open and maintain Lines of Communication (LOCs); active vs reserve forces, service mix (including Coast Guard), and coalition force mix (conditioned on the range of expected contributions by civilian organizations, including NGO/PVOs); requirements to support media and public affairs; forces to support military contingency operations; balancing tooth to tail ratio; and balancing effectiveness vs availability/feasibility.

FORCE PLANNING: DEPLOYMENT SCHEDULING {5}: identify human resources, materiel and procedures. The domain is reserve call-up. This task requires maintenance of information on immediate availability of reserves and (legal) availability of active service time.

COMMUNICATIONS ANALYSIS {8}: identify the human resources, materiel and procedures needed for communications, including non-standard communications with other government agencies, coalition forces, host government, and NGOs/PVOs.

2.7 ANALYZE LOGISTICS

The function of this analysis procedure is to determine the logistics support required for the operation.

FORCE PLANNING: DEPLOYMENT SCHEDULING {5}: plan for adequate logistics and supply for all mission forces and support humanitarian mission needs.

2.8 ANALYZE TRANSPORT

The function of this analysis procedure is to determine the transportation support required to initiate and sustain the operation.

FORCE PLANNING: DEPLOYMENT SCHEDULING {5}: determine the sequence of arrival by units required to accomplish the mission and provide security; determine deployment priorities to resolve bottlenecks; determine availabilities and capabilities of the transport resources needed to accomplish the mission, including any transport needed for other agencies, coalition partners, and NGOs/PVOs; establish LOCs; and plan for transportation support for mission forces, including appropriate NGOs/PVOs and media personnel.

2.9 EVALUATE MISSION

The function of this analysis procedure is to evaluate the status of an ongoing operation.

SITUATION AWARENESS {1}: to permit a complete and accurate evaluation of the mission status, present impact forecasts; ISR, including information concerning threat, friendly and neutral elements, and environmental information; cultural issues; results of the opposing COAs; METT-T analysis; centers of gravity; "enemy" threat; results of psychological operations (PSYOPs); casualty situation; infrastructure improvement requirements; and indigenous/client/refugee support requirements. Present the mission status to permit media and public affairs support.

FORCE PLANNING: DESIGNING FORCES {4}: identify human resources, materiel and procedures. The domain is determining redeployment priorities, comparing effectiveness in current and future tasks against the availability or feasibility of alternative options. This includes consideration for rotation of troops.

COA DEVELOPMENT, ANALYSIS, COMPARISON {6}: evaluate the impacts of "enemy" actions and responses; evaluate the current probability of overall mission success; support the creation and codification of COAs; support preparation of staff estimates; evaluate the impacts of alternative COAs; evaluate the impacts of alternative stationing and allocation of forces; evaluate the impacts of various uses of force; and evaluate the impacts of repositioning forces and systems.

TRANSITION PLANNING AND TRACKING OF OPERATIONAL DATA {7}: support regular input of data and recalculation of the MOEs, probability of success, and transition criteria; feed the situation awareness tool; support regular input of data and evaluation of casualty and other medical data; and support continuous replanning of the transition.

COST ANALYSIS {9}: provide information on full costs of a particular OOTW to support the Congressional Budget process.

2.10 SUPPORT TRANSITION

The function of this analysis procedure is to support the transition from military activities.

TRANSITION PLANNING AND TRACKING OF OPERATIONAL DATA {7}: provide current data to support the transition process.

2.11 ANALYZE RECOVERY

The function of this analysis procedure is to support the departure of U.S. forces and their reconstitution.

FORCE PLANNING: DESIGNING FORCES {4}: determine what retraining, etc., is needed to reconstitute the forces.

FORCE PLANNING: DEPLOYMENT SCHEDULING {5}: determine the sequence of departure of by units required to accomplish the mission and provide security; and determine availabilities and capabilities of the transport resources needed for departure, including any transport needed for other agencies, coalition partners, and NGOs/PVOs.

COST ANALYSIS {9}: provide information on costs incurred to support recovery of those costs from other U.S. agencies and from foreign organizations and governments; costs of a particular OOTW, including equipment depreciation, readiness losses, increased reserve recruitment and training costs, and perhaps other costs to support future acquisition, budgeting and training decisions; and actual costs of a completed OOTW to support improved estimates of future operations and reports to Congress on actual costs.

3. OOTW ANALYTIC TOOL RECOMMENDATIONS

The analysis of the procedures and tasks from Section 2 yields the set of tool categories that will satisfy the requirements. These tools are shown in Fig. 18. All of the tools draw from and feed the Situation Display/Data Warehouse combination and some of the tools have a natural sequential relationship, as shown in the figure. Fig. 19 links the tools to the OOTW analysis requirements [9].

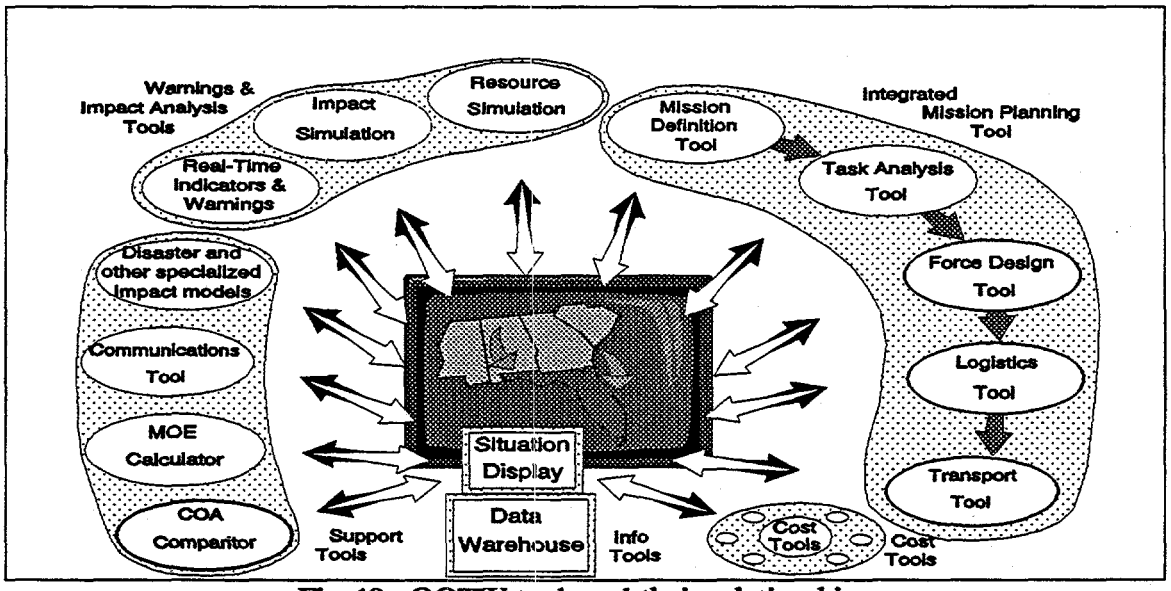

Fig. 18. OOTW tools and their relationships.

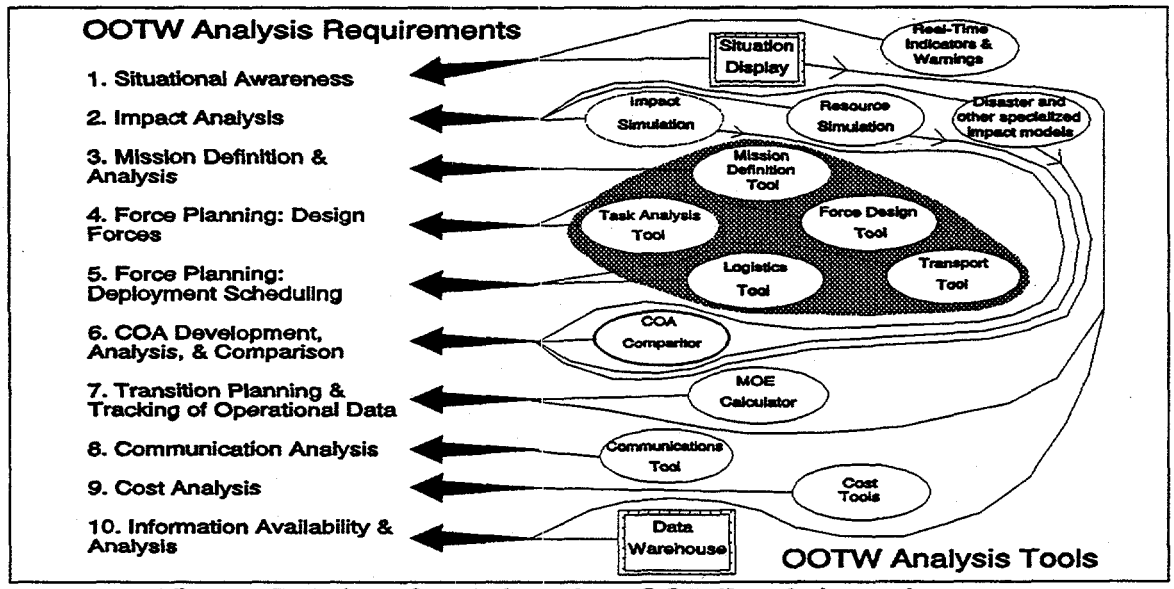

Fig. 19. Relation of analytic tools to OOTW analysis requirements.

This section describes the tools categories and recommends the placement of the OOTW tools within the intersections shown in Fig. 6. Three basic categories are listed: support by inclusion in JAMIP (JWARS or Joint Data Support (JDS)), support through joint community actions, and support by an individual user. Within these recommendations, joint M&S support or control may be supplied by the Analysis Council, JAMIP or the Modern Aids to Planning Program (MAPP), as appropriate.

Each of the tools is more fully described later in this section. The OOTW analysis tasks are restated to describe the analysis content of the tasks that are addressed by the particular tool. The list of tasks addressed by each tool is followed by a brief description of the nature of the tool. The UJTL tasks that relate to each tool are shown in Appendix B.

3.1 BASES FOR RECOMMENDATIONS

JWARS is a theater/campaign level combat simulation. It is being created to remedy the lack of an analytical tool that is balanced with respect to all U.S. military forces and that is capable of discriminating among differing C4ISR systems. It may also support certain analyses with respect to OOTW and meet some OOTW analysis tool requirements. Three OOTW (analysis) contexts and the respective JWARS functionality recommendations may be defined that clarify the problem.

> **Combat or near-combat MOEs predominate in the OOTW study question:** Include OOTW functionality in JWARS as long as the level of detail required for the OOTW functions is consistent with the general nature of JWARS.
>
> **Non-combat MOEs predominate; however, only at the very highest level.** That is, evaluation of the overall result relies on non-combat MOEs, but decisions during the course of the simulation can be made using combat or near-combat MOEs in all but a small number of instances, permitting manual intervention: Include OOTW functionality in JWARS as long as the level of detail is reasonable.
>
> **Non-combat MOEs are required to determine most decisions during the course of the simulation:** Exclude OOTW functionality from JWARS.

Most of the OOTW analysis tool requirements represent the needs of large segments or all of the military analysis community. There are several avenues of support available for any requirements that are not met by JWARS.

Two of these avenues are specifically organized to support joint M&S needs. The Modern Aids to Planning Program (MAPP) was created to provide analysis tool support to the CINCs and thus some OOTW tool requirements may be supported under MAPP. Second, JAMIP was created to improve the ability of DoD to conduct theater-level, joint analysis. JAMIP was designed to provide a support structure for the creation of JWARS, the updating of existing simulations until JWARS is available, the creation of JWARS-JDS, and the maintenance of JWARS. Some OOTW tool requirements may be supported under JAMIP.

Other organizations may also provide supporting resources. The OSD Comptroller is interested in costing OOTWs and is supporting some cost tool development. The US Transportation Command (TRANSCOM) provides tools to support transportation planning needs. In particular, TRANSCOM provides the Analysis Mobility Platform (AMP), which may be expanded to support some OOTW tool requirements. The Defense Advanced Research Projects Agency (DARPA) is supporting research on Advanced Logistics Planning (ALP) and may support some OOTW tool requirements. GCCS is creating a system for managing operations. Some OOTW tool requirements may be supported under GCCS. In addition, the Army Corps of Engineers, the Simulation Training and Instrumentation Command (STRICOM), USSOCOM, the Naval Health Research Center (NHRC), the Defense Special Weapons Agency (DSWA), the Federal Emergency Management Agency (FEMA), and other agencies have models that address some OOTW tool requirements.

Where there is no general need for a particular tool or where a generally-needed tool falls below the cutoff point for funding, individual users may be able to fund the tool for themselves. In addition, certain tools may be available as COTS products and may be individually purchased by interested users.

3.2 DIFFERENTIATION BY OOTW TYPE

Following the second Monterey workshop, the numerous types of OOTWs were regrouped (by analytical similarities) into four categories: Humanitarian Assistance/Disaster Relief operations (HA/DR), Peace Operations (PO), National Integrity (NI) operations, and Military Contingency Operations (MCO).

Table 8 lists the operations in the humanitarian assistance/disaster relief category.

Table 8. Humanitarian assistance/disaster relief operations (HA/DR)

Humanitarian Assistance
Humanitarian and Civic Assistance
Disaster Relief
Disaster Relief Domestic
Disaster Relief International
Disaster Control
Consequence Management

Table 9 lists the operations that are included within the category of peace operations.

Table 9. Peace operations (PO)

- Peacekeeping Operations (PK)
  - Observer Missions
  - UN Chapter VI
  - Preventive Diplomacy
  - Preventive Deployment
  - Delegatory Peacekeeping
  - Peacemaking
  - Military Support to Civil Authorities (MSCA)
- Peace Enforcement Operations (PE)
  - UN Chapter VII
  - Peace Imposition
  - UN Chapter VI ½
  - Aggravated Peace Support Operation (APSO)
- Pre-Conflict Peace Building
- Post-Conflict Peace Building
- Arms Control
- Deterrence
- Disarmament
- Counterproliferation

Table 10 lists the operations that are included within the category of national integrity operations.

Table 10. National integrity operations (NI)

- Counterdrug (CD) Operations
- Combatting Terrorism (CT)
  - Antiterrorism
  - Counterterrorism
- Counterinsurgency (CI)
- Nation Assistance (NA) or Nation Building
  - Security Assistance
  - Foreign Internal Defense (FID)

Table 11 lists the operations in the military contingency operations category.

Table 11. Military contingency operations (MCO)

Enforcement of Sanctions/Maritime Intercept Operations (MIO)/Quarantines
Enforcing Exclusion Zones
Ensuring Freedom of Navigation (FON) and Overflight
Protection of Shipping
Show of Force Operations
Strikes or Attacks
Raids
Recovery Operations/Search and Rescue (SAR)
Relocation of Refugees/Illegal Immigrants/Illegal Emigrants
Noncombatant Evacuation Operations (NEO)
Support to Insurgency

This categorization of OOTW types (in the tables above) will be referred to in the recommendations below.

3.3 WARNINGS AND IMPACT ANALYSIS TOOLS

Three tools are included in this group. The real-time indicators and warnings tool serves to filter and interpret world news in the light of possible future OOTWs. The impact simulation models the significant relationships included in and surrounding an OOTW to permit prediction of the results of actions, whether human or environmental. The resource simulation models the changes in resource consumption and sequestration over the course of an OOTW. These tools are among the most difficult (scientifically) to create, but are essential to the analysis of OOTWs.

3.3.1 Real-Time Indicators and Warnings

The object of the tool is to produce indicators and warnings of negative events.

> The goal is to produce a forecast of the regions of potential instability, the predicted dates, the related probabilities, and the nature of the instabilities.

The tool needed is an automatic compiler and interpreter of current events. It should have automatic data feeds from commercial news sources and input from the intelligence community, the Department of State, and from the NGO/PVO community. This tool inherits a priority of "1" (critical need) from the OOTW tool requirements [9].

Because real-time indicators and warnings are real, not simulated, a tool to produce them does not belong in JWARS. Although the time horizon of interest differs within the analytical community, such a tool is needed by all parts of the community. Several academic efforts are underway in this area (e.g., the Program for the Assessment of Nonviolent Direct Action (PANDA) [3]); however, no comprehensive, validated, unclassified tool has been

identified. DoD-funded research in this area would be a low cost option and should result in a useful interim tool. The recommendation is for joint support. It appears to belong in the GCCS family (allied with the Department of State and FEMA); however, its creation should be overseen by a joint M&S analytical community body. The following tools will be useful in creating the analysis tool. More information on them is provided in Appendix C.

- Africa and Latin America Database, Unclassified (ALADUN), measuring expert consensus forecast, limited set of countries
- Auto Summarizer (AS), automatic summaries of text
- Assessing Vulnerability to Instability (AVI), short range (6 months) govt instability
- Famine Early Warning System (FEWS), famine warning
- Global Events Data System (GEDS), semi-automated, includes inter-state and domestic/inter-ethnic conflict
- Global Emergency Warning and Relief Network (GEOWARN), warnings on many types of disasters
- Humanitarian Early Warning System (HEWS), humanitarian crisis warning
- Kansas Events Data System (KEDS), automated parsing of electronic news, limited to inter-state, large volume of news coverage
- Normality Analysis Process (NAP)
- Protocol for Assessing Nonviolent Direct Action (PANDA), predict "hot spots"/data, uses KEDS
- Political/Economic Risk In Countries and Lands Evaluation (PERICLES), cultural, ethnic strife, long range
- Regional Security Strategy Implementation Analysis (RSSIA), USSOUTHCOM political stability
- State Failure Project (SFP), multiple indicators, long range

3.3.2 Impact Simulation

The object of the tool is to predict the results of actions within an OOTW context. This includes the impacts of US military actions on the situation, the impacts of other actors in the theater on the situation, the impacts of natural forces on the situation, and any impacts of actors outside the theater. The impacts include changes in the political situation, the economic situation, the physical situation, the medical situation, the agricultural situation, and the military situation.

This is the critical facility for concept and doctrine development and analysis, for systems effectiveness and trade-off analysis, and for force assessment. It is also critical for valid assessments in the execution planning phase of crisis action planning. Each of these areas requires a tool that exposes any difference in results from the use of different concepts of employment, doctrines, force structures, or availability of systems. The **impact** of the differences in input must be affected by the relevant environment, **in the case of OOTW - the political, economic, physical, medical, agricultural, and military INTERACTING environment.**

The first goal is to produce the forecast of the regions of potential instability, the predicted dates, the related probabilities, and the nature of the instabilities.

The second goal is to

- predict results, both desirable and undesirable, of all actions;
- evaluate the impacts of alternative stationing and allocation of forces;
- evaluate the impacts of repositioning forces and systems;
- identify whether tasks involved in the use of force, whether lethal or non-lethal, are required;
- evaluate the impacts of various uses of force;
- evaluate the impacts of "enemy" actions and responses;
- provide a framework for the METT-T analysis, answer "what-if" questions, and identify necessary materiel, human resources and procedures; and
- evaluate the current probability of overall mission success.

The tool needed is a complex, discrete event simulation. Entities that must be modeled include significant individuals, major interest groups, and major demographic sub-populations. Attributes that must be addressed include political, economic, and sociological factors. The requirements are described in more detail by Hartley [8]. This tool inherits a priority of "1" from the OOTW tool requirements [9].

Peace operations, HA/DR and national integrity operations that have transitioned into combat situations may be modeled in JWARS, depending on adequacy of scale. Despite the specific inclusion of UJTL tasks for peace operations (ST 8.2.8.1, ST 8.2.8.2, and ST 8.2.8.3) into JWARS by the ORD (see Appendix B for other tasks), the tenor of the other tasks included imply that no significant political, economic or social logic will be included in JWARS, precluding impact analysis of anything besides combat operations.

Many military contingency operations are functionally similar to combat operations, differing principally in context. Up to a certain point, a strike or raid is a strike or raid, whether performed in the midst of a war or during (nominal) peace. The physical actions may be identical. The difference appears when the results are evaluated against the context. A

particular kind of failure in peacetime may have severe political repercussions, where none would result during warfare. Other operations have relatively simple connections with the politico-economic-social environment. For example, many Noncombatant Evacuation Operations (NEOs) can be modeled as simple (or complex) logistical operations, with small unit combat actions as possible accompanying actions. Depending on scale, JWARS should handle the majority of the simulation of these operations, perhaps reserving larger implications to the analyst.

Ideally, impact simulation would be contained in the standard joint simulation - JWARS; however, modeling mission accomplishment is a problem if no consideration is given (within JWARS) for the requisite connections between physical activities and the politico-economic-social environment (e.g., agriculture, public health, and popular support for the government). Where social interactions (blue/red, blue/white, blue/blue, red/white, red/red, and white/white) are critical to the adequate modeling of these operations, a separate impact simulation tool will be required because JWARS will not contain this functionality. Research is required to determine how to model these interactions. Thus, questions concerning the overall value or impact (beyond consumption of or competition for resources and sufficiency for any potential combat operations) of an operation depend on connections to the politico-economic-social environment and must be addressed by an impact simulation.

Unfortunately, the nature of social interactions is a matter for debate and consequently the proper mathematical expressions of these interactions and the best methods for modeling them are undecided. While at least two candidate simulations exist (the Army's National Simulation Center's (NSC) model, Spectrum [14], and the Deployable Exercise Support (system)/ Civil Affairs Module (DEXES/CAM) at USSOUTHCOM [16]), these are regarded with some misgivings by working analysts, apparently because of lack of transparency or because they are used for training. The Situational Influence Assessment Module (SIAM) of SAIC uses another technique to address social interactions. It is an influence diagram-based model, not a simulation model.

DoD-funded research in this area must be regarded as a long-term investment and would be relatively expensive. Other possibilities have been advanced, including the modeling environments, Global Crisis Analysis Model (GCAM) of the Navy N81 [4] and C3I Application Building Environment (CABLE) [1], and a modification of the COTS model, Sim City™ [8]. Appendix C lists more information about these tools and other potentially useful tools. (Entries in the impact simulation category may also be valuable in the support tools category.)

The general recommendation is to embark on a joint sponsored research program to test concepts, approaches and algorithms, informed by complexity theory. The specific recommendation is to initiate a project to compare DEXES/CAM; SPECTRUM; the modeling environments, GCAM and CABLE; and the concept of modifying Sim City to determine the best approach to producing an impact model. However, JWARS should be structured to permit the addition of this functionality at a later time.

- C3I Application Building Environment (CABLE), modeling OOTW

- Deployable Exercise Support / Civil Affairs Module (**DEXES/CAM**), civil affairs, for training
- Global Crisis Analysis Model (GCAM), simulation environment
- SIAM, impact of actions, instability
- Sim City™, impact of actions, instability
- **SPECTRUM**, impact of actions, instability, for training

3.3.3 Resource Simulation

The object of the tool is to model the consumption or temporary sequestration of US resources within an OOTW context. Note that more sophisticated measures of resources (as opposed to mere numbers) are required. For example, suppose 100 soldiers are needed for an OOTW; however, they must all be of rank E5 or above. Several battalions may be rendered non-combat ready in order to supply this need, not just a company, as mere numbers might suggest.

This is the critical element in deliberate planning and crisis action planning (up to replanning during execution), for these assume an approved and known doctrine of force employment, force structure, and systems availability. It is too late to develop these on the fly. Force tailoring will be employed, but only within the limits of previous doctrine.

The first goal is to model the variety of resource requirements (and changes over time) in and for

- infrastructure improvements;
- humanitarian operations;
- engineering support;
- medical support;
- joint/interagency/coalition support;
- indigenous/client/refugee support, including location tracking;
- communications, including non-standard communications with other government agencies, coalition forces, host government, and NGOs/PVOs;
- ISR concerning threat, friendly and neutral elements and environmental information;
- media and public affairs support;

- PSYOPs;
- adequate protection of all forces, including other agencies, coalition forces, and NGO/PVOs; and
- the use of force, whether lethal or non-lethal.

The second goal is to include all necessary considerations. The domains are

- heavy vs light forces and weapons mix plus forces needed to open and maintain LOCs;
- active vs reserve forces, service mix (including Coast Guard), and coalition force mix (conditioned on the range of expected contributions by civilian organizations, including NGO/PVOs);
- readiness and availability of U.S. military forces, U.S. agency elements, and coalition elements;
- forces to support military contingency operations;
- balancing tooth to tail ratio;
- balancing effectiveness vs availability/feasibility;
- reserve call-up (requires maintenance of information on immediate availability of reserves and availability of active service time);
- determining redeployment priorities, comparing effectiveness in current and future tasks against the availability or feasibility of alternative options (including consideration for rotation of troops);
- determining what retraining, etc., is needed to reconstitute the forces; and
- adequate logistics and supply for all mission forces and to support humanitarian mission needs.

The third goal is to model all necessary transportation and logistics considerations:

- sequence of arrival by units required to accomplish the mission and provide security;
- deployment priorities to resolve bottlenecks;
- availabilities and capabilities of the transport resources needed to accomplish the mission, including any transport needed for other agencies, coalition partners, and NGOs/PVOs;

- establishment of LOCs;
- transportation support for mission forces, including appropriate NGOs/PVOs and media personnel;
- sequence of departure of by units required to accomplish the mission and provide security; and
- availabilities and capabilities of the transport resources needed for departure, including any transport needed for other agencies, coalition partners, and NGOs/PVOs.

The tool needed is a complex, discrete event simulation that can define time-based changes in resource consumption and availability. This tool inherits a priority of "1" from the OOTW tool requirements [9].

Depending on scale, JWARS should handle the mechanical aspects of transport, gross logistics, and any combat actions, including losses for all causes. (Note that this means that the medical resources required for both combat and disease/non-battle injuries (DNBI) must be modeled in combat situations or the true impact of OOTW resource consumption and sequestration on MTWs cannot be observed.) Symbolic operations may be modeled in JWARS. Symbolic operations involve calculation of resource consumption and sequestration (including stripping of essential personnel), with scripted posture changes or manual interventions to create end results. These operations may not be used to draw conclusions about the impact of decisions beyond resource consumption and sequestration. The recommended tool for resource simulation is JWARS.

- **JWARS**

3.4 INTEGRATED MISSION PLANNING TOOL

The five separate tools that comprise this group should ultimately be seamlessly integrated, although, the integration may initially be loose. Each tool feeds its successor, while permitting re-entry for iterative planning. The tools are a mission definition tool, a task analysis tool, a force design tool, a logistics tool, and a transportation tool.

These tools are relatively simple (scientifically); however, to be useful in an OOTW context, they require careful definition with respect to applicability to joint, coalition and non-military component analysis. To the extent that they are used in the analysis and planning for actual missions, these tools should reside on PCs, rather than UNIX computers, and should be developed with joint M&S support. Where they are used in the simulation of operations, they should be integrated or linked with JWARS.

3.4.1 Mission Definition Decision Support Tool

The object of the tool is to support an accurate and complete definition of the mission.

The first goal is to provide a framework for

- determining the relationships among MOEs, MOPs and mission success;
- developing appropriate ROEs;
- determining the desired mission end-state, type of transition and transition criteria; and
- defining the relationships among the military, government agencies, coalition forces, and NGOs/PVOs.

The second goal is to support continuous replanning of the transition.

The third goal is to provide information on relative (full) costs to support the selection of the mission plan.

The tool needed is a decision support tool that supplies options that are linked to criteria appropriate to each option. The mission definition tool should provide a "reality check" to ensure that the complete implications of the mission are fully understood. This tool inherits a priority of "2" from the OOTW tool requirements [9].

This tool lies almost wholly in the analysis and planning for actual missions domain and belongs in the joint M&S support category. The only candidates that have been identified are the following (more information is found in Appendix C):

- Concept Model of Peace Operations (CMPO), peace operations checklist
- Field Anomaly Relaxation (FAR), scenario generation

3.4.2 Task Analysis Support Tool

The object of the tool is to support an accurate and complete analysis of the mission tasks.

The first goal is to identify tasks in and for

- infrastructure improvements;
- humanitarian operations;
- engineering support;
- medical support;
- joint/interagency/coalition support;
- indigenous/client/refugee support, including location tracking;

- communications, including non-standard communications with other government agencies, coalition forces, host government, and NGOs/PVOs;
- ISR concerning threat, friendly and neutral elements and environmental information;
- media and public affairs support;
- PSYOPs; and
- adequate protection of all forces, including other agencies, coalition forces, and NGO/PVOs.

The second goal is to identify whether tasks involved in the use of force, whether lethal or non-lethal, are required.

The tool needed is a decision support tool that connects missions to strategies to tasks, both explicit and implied, in the OOTW domain. It should identify both those tasks that are central to the mission and any contingent tasks that might be implied by reasonable shifts in mission definition. It should also support replanning as the situation changes. This tool inherits a priority of "1" from the OOTW tool requirements [9].

This tool is needed for both actual mission analysis and planning and for the analysis and planning preparations for JWARS. Whether it should be considered as part of JWARS or supported under joint M&S action is more a matter of definition than of substance. However, for crisis action planning, it should be hosted on a PC or provided in notebook (hardcopy) form. The only proven candidate (actually used and found useful) for similar functionality is shown below (with more information and information on other potentially useful tools in Appendix C):

- Graphic Crisis Management Plan (GCMP), combined flowchart, checklist, rolodex

3.4.3 Force Design Tool

The object of the tool is to support the designation of U.S. forces required for an operation in an OOTW context.

The first goal is to identify human resources, materiel and procedures. The domains are

- heavy vs light forces and weapons mix plus forces needed to open and maintain LOCs;
- active vs reserve forces, service mix (including Coast Guard), and coalition force mix (conditioned on the range of expected contributions by civilian organizations, including NGO/PVOs);

- readiness and availability of U.S. military forces, U.S. agency elements, and coalition elements;
- requirements to support media and public affairs;
- forces to support military contingency operations;
- balancing tooth to tail ratio;
- balancing effectiveness vs availability/feasibility;
- reserve call-up (requires maintenance of information on immediate availability of reserves and availability of active service time);
- communications, including non-standard communications with other government agencies, coalition forces, host government, and NGOs/PVOs;
- determining redeployment priorities, comparing effectiveness in current and future tasks against the availability or feasibility of alternative options (including consideration for rotation of troops);
- determining what retraining, etc., is needed to reconstitute the forces; and
- gathering and codifying the cultural issues and to identify proper procedures with respect to cultural issues.

The second goal is to provide a framework for the METT-T analysis, answer "what-if" questions, and identify necessary materiel, human resources and procedures.

The tool needed is a decision support tool that connects the tasks to generic resources and connects generic resources to actual available resources, including U.S. military, U.S. non-military, foreign government, NGO/PVO, and contractor resources. Data requirements include task capability for all resources (or the facility for user input for unique resources) and availability data (based on reserve commitments, etc.). It should provide for restrictions on choices based on cultural issues. Processing should include selection of military resources and substitution of other resources. The tool should also support replanning as the situation changes. This tool inherits a priority of "1" from the OOTW tool requirements [9].

This tool is needed for both actual mission analysis and planning and for the analysis and planning preparations for JWARS. Whether it should be considered as part of JWARS or supported under joint M&S action, is more a matter of definition than of substance. However, for real-time planning, it should be hosted on a PC. The leading contenders as prototypes for this tool are the Contingency Analysis Planning System (CAPS) model, sponsored by J-8, and the Joint Electronic Battlebook (JEB), sponsored by USACOM. CAPS requires expansion to provide joint and combined forces coverage, as well as NGO/PVO coverage. It should probably also be reprogrammed in FoxPro™, for speed. JEB also requires expansion.

- **CAPS**, define forces needed to achieve the military objective

- **JEB**, define resources needed

3.4.4 Logistics Analysis Tool

The object of the tool is to support the logistics analysis of the mission in an OOTW context.

> The goal is to plan for adequate logistics and supply for all mission forces and to support humanitarian mission needs.

The tool needed is a decision support tool that derives the logistics requirements from the total force structure. It should allow for supply from outside sources and provide for supply of non-military personnel. It should support replanning as the situation changes. This tool inherits a priority of "1" from the OOTW tool requirements [9].

Two different tools are needed because of the differences in resolution required for actual mission analysis and long-term planning and analysis. The long-term planning and programming tool will be included as part of JWARS. The real-time planning tool should be hosted on a PC and supported by joint M&S action. The leading contender as a prototype for this tool is the Force Analysis Spreadsheet Tool - OOTW Requirements (FAST-OR) model, sponsored by the Army Concepts Analysis Agency (CAA). It should be reprogrammed to interface with CAPS or JEB and expanded similarly. Other tools that may provide supporting concepts are given in Appendix C.

- **FAST-OR**, non-combat units are defined and support requirements inferred, supply & services

3.4.5 Transport Analysis Tool

The object of the tool is to support the transportation analysis for mission arrival, sustainment, and departure in an OOTW context.

> The goal is to plan for all transportation related support:

- determine the sequence of arrival by units required to accomplish the mission and provide security;

- determine deployment priorities to resolve bottlenecks;

- determine availabilities and capabilities of the transport resources needed to accomplish the mission, including any transport needed for other agencies, coalition partners, and NGOs/PVOs;

- establish LOCs;

- plan for transportation support for mission forces, including appropriate NGOs/PVOs and media personnel;

- determine the sequence of departure of units required to accomplish the mission and provide security; and

- determine availabilities and capabilities of the transport resources needed for departure, including any transport needed for other agencies, coalition partners, and NGOs/PVOs.

The tool needed is a decision support tool that plans the transport requirements, based on all appropriate constraints. It must support replanning when the situation changes after some transport has been accomplished. This tool inherits a priority of "1" from the OOTW tool requirements [9].

Two different tools are needed because of the differences in resolution required for actual mission analysis and long-term planning and analysis. The long-term planning and programming tool will be supplied by incorporating the Model for Intertheater Deployment by Air and Sea (MIDAS) into JWARS. The execution planning tool should be hosted on a PC and supported by joint M&S action. The leading contender as a prototype for this tool is the Joint Flow and Analysis System for Transportation (JFAST) model, sponsored by the TRANSCOM. Other tools that may provide supporting concepts are given in Appendix C.

- **JFAST**, logistics planning, capacity planning, lift

- **MIDAS**, capacity planning, lift

3.5 SUPPORT TOOLS

This group contains three specific tools and a cluster of several tools related by type. The COA comparitor permits the development of courses of action through several levels of alternatives. The MOE calculator supports the calculation and tracking of MOE values. The communications tool supports planning the communications system within the complex context of OOTWs. The cluster of disaster impact tools supports the estimate of the situation in several technical areas, such as engineering and health. The recommendations for the general support tools are as varied as are the different tools gathered into this category.

3.5.1 COA Comparitor

The object of the tool is to compare alternate COAs.

The goal is to

- support the creation and codification of COAs;

- support preparation of staff estimates; and

- evaluate the impacts of alternative COAs.

The tool should permit the analyst to identify decision alternatives, potential responses to those alternatives, and subsequent decision alternatives. The tool would calculate the range of possible results and the associated expected values, showing which COA yields the most favorable expected value. This tool inherits a priority of "1" from the OOTW tool requirements [9].

It is recommended that a COTS influence diagram / decision tree product be used to provide this tool; however, it should be supported by joint M&S to ensure common practices and availability. The tool needed is a Commercial Off-the-Shelf (COTS) influence diagram/decision tree program, such as Decision Programming Language™ (DPL). This tool permits the analyst to identify decision alternatives, potential responses to those alternatives, and subsequent decision alternatives. Probabilities and valuations for the various alternatives may be either derived from an impact simulation or from the analyst's experience. The program then calculates the range of possible results and the associated expected values, showing which COA yields the most favorable expected value. More information is given in Appendix C.

- **DPL**, influence diagrams and decision trees

3.5.2 MOE Calculator

The object of the tool is to process data for determining the current measures of performance, effectiveness, success, and transition criteria.

> The goal is to support regular input of data and recalculation of the MOEs, probability of overall mission success, and transition criteria.

This tool should support the design and analysis of connections among MOPs, MOEs, mission success, and transition criteria. It should support use in the field, both in data input and output and in reassessment of the formulation of MOEs, success, and transition criteria. This tool inherits a priority of "3" from the OOTW tool requirements [9].

Common tools, such as the Analytical Hierarchy Process (AHP), are inadequate because they depend on the sum of weighted terms (arithmetic averaging). Some elements may be expected to be critical (as opposed to important); that is, failure of such elements will result in mission failure irrespective of the values of other elements. A tool that supports both arithmetic and geometric (multiplicative combinations) averaging is required. It is recommended that this tool be developed with joint M&S support to ensure maximum support to the CINC analyst cells and to ensure that JWARS replicates the functionality in its calculations of results, to the maximum extent compatible with JWARS functionality in the politico-economic-social domain. The Valuated State Space (VSS) provides a basis for correctly making the needed calculations. (See Appendix C for more information.)

- **VSS**, special calculations

3.5.3 Communications Analysis Tool

The object of the tool is to support the creation of a complete communications plan in an OOTW context.

> The goal is to design the required communications, including non-standard communications with other government agencies, coalition forces, host government, and NGOs/PVOs.

The tool needed is a communications planner that supports non-standard communications with other government agencies, coalition forces, host government, and NGOs/PVOs. It requires data on the desired connectivity and the available resources. This tool inherits a priority of "3" from the OOTW tool requirements [9].

It is recommended that this tool be developed (or modified from an existing tool) under joint M&S support, in coordination with GCCS. Potentially useful tools are listed in Appendix C.

3.5.4 Disaster and Other Specialized Impact Models

The object of these tools is to support an accurate and complete assessment of environmental, infrastructure and humanitarian impacts.

> The goal is to identify impacts on
>
> - infrastructure;
> - humanitarian operations;
> - engineering support;
> - medical support; and
> - indigenous/client/refugee support, including location tracking.

These models should predict the levels and locations of damage to infrastructure and agriculture caused by disasters of various types. These models should also predict the engineering, medical and food/water support required and the extent of any refugee problems. Some of these tools may also be required in the field during execution. These tools were not specified earlier [9], but are implied by the analytical tasks. As such, they are given a priority of "3."

Several disaster and other specialized impact models are available from sources such as FEMA, USSOCOM, DSWA, NHRC, STRICOM, and the Army Corps of Engineers. It is recommended that these models be hosted by a joint M&S activity to identify candidate models and maximize commonality and integration with the needs of the DoD. More information about the tools is given in Appendix C.

- Air Courses of Action Assessment Model (ACAAM), air strike planning
- All Hazards Situation Assessment Program (ASAP), disaster effects
- Consequence Assessment Tool Set (CATS), results assessment for natural disasters
- Common Operational Modeling, Planning and Simulation Strategy, a shell for connecting simulations
- Counterdrug Modeling and Simulation System (CMASS), counterdrug seminar game
- Crisis Management System (CMS), results assessment for disasters
- Disaster Relief Anchor Desk (DIAD), estimating damage and mitigation requirements
- Exercise Template (ET), disaster preparedness
- Grey Team (GT), expert system
- Humanitarian Demining Decision Support Tool (HDDST), demining support
- Logistics Over the Shore (LOTS), detailed landing model
- Mission Effectiveness Model (MEM), Special Operations Forces (SOF) Seal landing
- Naval Simulation System (NSS), naval intelligence
- Pathgames (PATH)
- PLOWSHARES, training in disaster management
- Statistical analysis packages (sa), analyze data
- Security Exercise Evaluation System (SEES), training system for site security
- Spreadsheets (sprd), multipurpose
- Seminar Wargames (sw), intensive human interactions
- SWARM, multiple objective functions, used in artificial life models
- Urban Combat Computer Assisted Training System (UCCATS), training in urban warfare

- Venice Process (VENICE), long range

3.6 COST MODELS

Seven tools make up this group. Their object is to calculate the cost information for various aspects of OOTWs.

The goal is to provide cost information on

- incremental costs of notional OOTWs to support the long-term analysis;
- probable incremental costs to support the decision on engaging in a particular OOTW;
- relative (full) costs to support the selection of the mission plan;
- costs incurred to support recovery of those costs from other U.S. agencies and from foreign organizations and governments;
- full costs of a particular OOTW to support the Congressional Budget process;
- costs of a particular OOTW, including equipment depreciation, readiness losses, increased reserve recruitment and training costs, and perhaps other costs to support future acquisition, budgeting and training decisions; and
- actual costs of a completed OOTW to support improved estimates of future operations and reports to Congress on actual costs.

The required precision of the cost estimates may differ for differing uses. It may also be true that the size of the organization providing support, and thus being impacted by the cost, may affect the level of precision required for a given use for that organization. For example, a variation of a million dollars might be acceptable within the entire Army, but might wreak major havoc in a smaller organization.

The tools needed are either spreadsheet or database tools that permit calculations of the appropriate costs. These tools inherit a priority of "3" from the OOTW tool requirements [9].

It is recommended that these models be developed by joint M&S support. Appendix C gives information on some models that may provide useful input to the process.

3.7 INFORMATION TOOLS

There are two tools in this category. The situation display presents the information concerning the situation in a manner designed to maximize understanding. The data warehouse either stores or provides links to (as appropriate) all pertinent data. The data and their useability are critical to good analysis in the OOTW domain, as well as in the combat

domain. However, the data required for OOTW analysis and the display requirements are in an embryonic state when compared to the state of affairs of combat analysis.

3.7.1 Situation Display

The object of the tool is to display the current (or possible future) situation.

The first goal is to permit a complete and accurate definition of the situation and a complete and accurate evaluation of the mission status by presenting

- instability forecasts;
- impact forecasts;
- data on and recalculation of the MOEs, probability of success, and transition criteria;
- readiness of U.S. military forces, U.S. agency elements, and coalition elements;
- ISR concerning threat, friendly and neutral elements and environmental information;
- cultural issues;
- results of the opposing COAs;
- METT-T analysis;
- centers of gravity;
- "enemy" threat;
- results of PSYOPs;
- casualty and other medical situation;
- infrastructure improvement requirements;
- indigenous/client/refugee support requirements and location tracking;
- current data to support the transition process;
- estimates on incremental costs of notional OOTWs to support the long-term analysis;
- estimates on probable incremental costs to support the decision on engaging in a particular OOTW; and

- estimates on full costs of a particular OOTW to support the Congressional Budget process.

The second goal is to adequately present the definition of the situation and the mission status for media and public affairs support.

The Situation Awareness tool has two applications: as a fixed-site tool for early, real-time planning, and as a mobile tool for use during the operation. In both modes, this tool will be required to display the geographically-linked data on an appropriately scaled map, with various overlays and symbology and simultaneously display windows of tabular, textual, and various support programs. This tool should provide the facility to execute many of the tools described earlier. This tool inherits a priority of "2" from the OOTW tool requirements [9].

The situation display should be created under joint M&S support, in coordination with GCCS, to maximize integration with the data warehouse and the other OOTW analytical tools. The most likely candidate for expansion to include the required functionality is the GCCS Anchor Desk. Information on candidate tools is given in Appendix C.

- GCCS **Anchor Desk** (GCCS AD), information display and handling

3.7.2 Data Warehouse

The object of the tool is to store (or link to storage locations) all OOTW related data and facilitate its rapid retrieval.

Data that must be stored or retrieved from the data warehouse includes

- instability forecasts;
- impact forecasts;
- estimates of incremental costs of notional OOTWs to support the long-term analysis;
- estimates of probable incremental costs to support the decision on engaging in a particular OOTW;
- estimates of full costs of a particular OOTW to support the Congressional Budget process;
- estimates of relative (full) costs to support the selection of the mission plan;
- estimates of costs incurred to support recovery of those costs from other U.S. agencies and from foreign organizations and governments;
- estimates of costs of a particular OOTW, including equipment depreciation, readiness losses, increased reserve recruitment and training costs, and perhaps other costs to support future acquisition, budgeting and training decisions;

- estimates of actual costs of a completed OOTW to support improved estimates of future operations and reports to Congress on actual costs;
- relationships among MOEs, MOPs and mission success;
- ROEs;
- desired mission end-state, type of transition and transition criteria;
- readiness and availability of U.S. military forces, U.S. agency elements, and coalition elements;
- relationships among the military, government agencies, coalition forces, and NGOs/PVOs;
- current values of the MOEs, probability of success, and transition criteria;
- communications requirements;
- ISR concerning threat, friendly and neutral elements, and environmental information;
- cultural issues;
- results of the opposing COAs;
- METT-T analysis;
- geographical and demographic data for the area;
- centers of gravity;
- "enemy" threat;
- results of PSYOPs;
- availability of reserves and availability of active service time;
- casualty and other medical situation;
- infrastructure improvement requirements;
- engineering support requirements;
- joint/interagency/coalition support requirements;
- indigenous/client/refugee support requirements and location tracking;

- redeployment priorities and plans for rotation of troops;
- current data to support the transition process; and
- retraining and reconstitution requirements.

Plans that must be stored and retrieved include

- transition plan;
- communications plan;
- logistics plan;
- ingress transport plan;
- operations transport plan; and
- egress transport plan.

The Data Warehouse connects to the Situation Awareness tool in two modes. For Long-Term Planning and Programming, data are fed to the Data Warehouse from the appropriate tools or linked from appropriate extant databases and drawn on by the fixed-site Situation Awareness tool. For Real-Time Planning, initial data are uploaded to the portable Situation Awareness tool. Subsequently-produced data are fed to the Situation Awareness tool as they are produced and then periodically down-loaded to the Data Warehouse. This tool inherits a priority of "1" from the OOTW tool requirements [9].

The data warehouse should be developed under the JWARS JDS activity. The rationale for including it under JDS is that a data warehouse will require a joint, dedicated, technical, full-time organization for its creation and support and there appears to be no good reason for creating another such organization.

- JDS, maintains JWARS data in usable formats

3.8 RECAPITULATION OF THE RECOMMENDATIONS

Fig. 20 recapitulates the recommendations pictorially. It shows the major relationships among the tools and the recommended source of, or control of, the tools. When the tools shown in Fig. 20 are mapped back to the OOTW analysis requirements, only a quarter of the requirements will by satisfied by JWARS, as shown in Fig. 21. However, the figure also indicates the vast majority of the rest of the requirements should not be expected to be satisfied by JWARS because they require non-simulation tools or because they require very specialized simulation tools potentially available elsewhere.

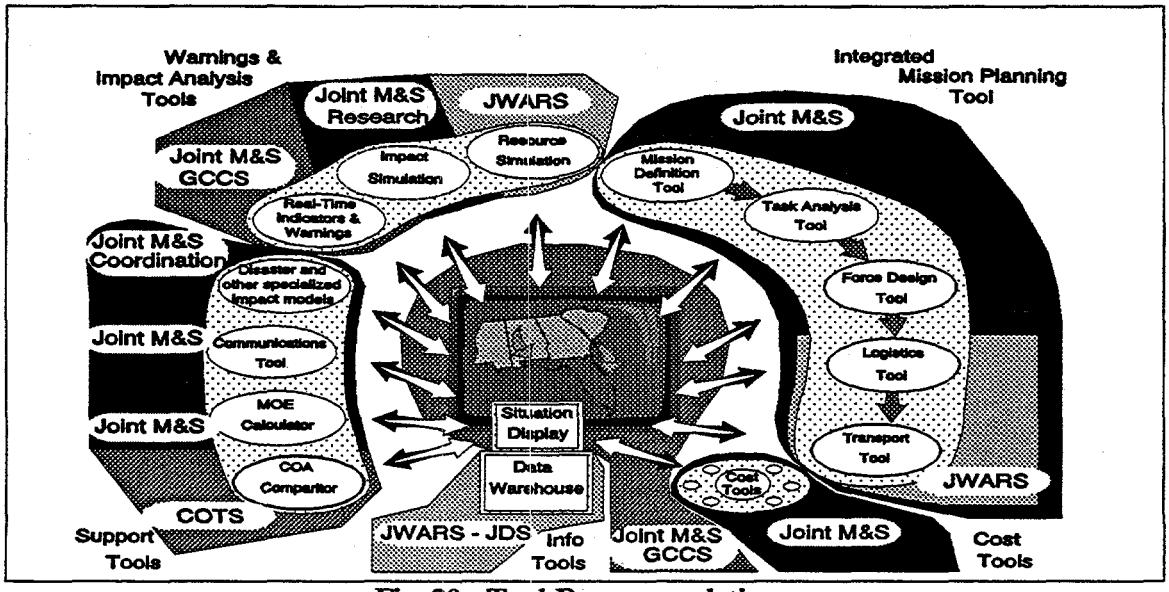

Fig. 20. Tool Recommendations.

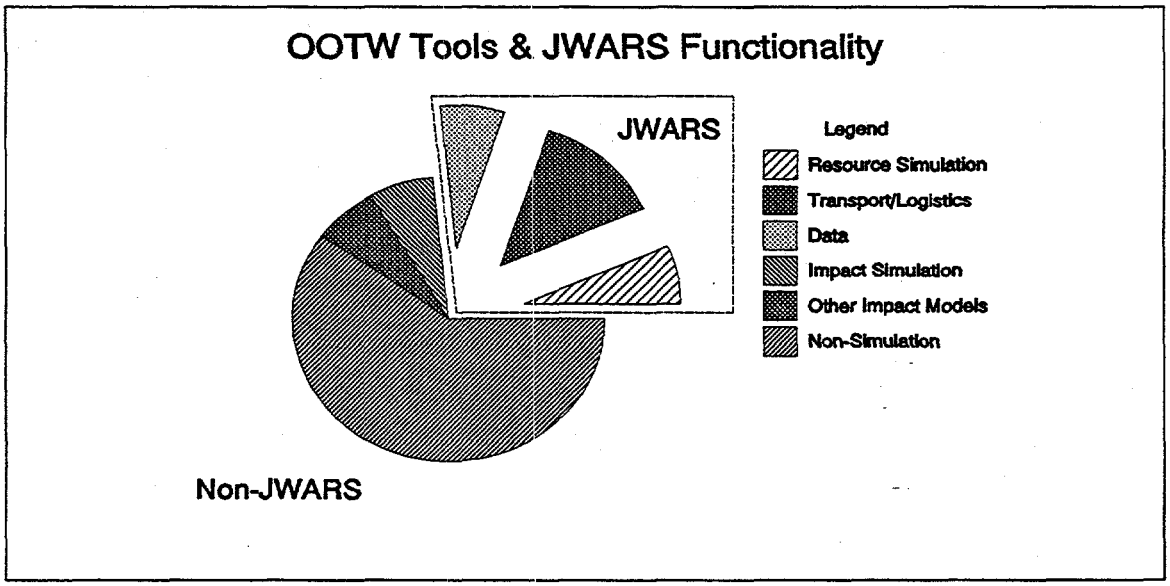

Fig. 21. Split of OOTW analysis requirements to JWARS.

Table 12 lists the OOTW analysis tools, the recommended controlling authority (and brief rationale), and the priority for the tool.

Table 12. Recommended Toolset				
OOTW Tool	**Candidates**	**Authority**	**Rationale**	**Priority**
WARNINGS AND IMPACT ANALYSIS TOOLS				
Real-Time Indicators and Warnings		Joint M&S	Common need, linked to GCCS	1
Impact Simulation				
Peace Operations, HA/DR, National Integrity operations	DEXES/CAM, SPECTRUM	Joint M&S	Common need for research	1
Military contingency operations	JWARS	JAMIP	Included in ORD	1
Resource Simulation	JWARS	JAMIP	Included in ORD	1
INTEGRATED MISSION PLANNING TOOL				
Mission Definition Decision Support Tool		Joint M&S	Common need	2
Task Analysis Support Tool	GCMP	Joint M&S	Common need	1
Force Design Tool	CAPS, JEB	Joint M&S	Common need	1
Logistics Analysis Tool	FAST-OR	Joint M&S	Common need	1
Transport Analysis Tool				
Execution Planning	JFAST	Joint M&S	Common need	1
Other	JWARS	JAMIP		1
SUPPORT TOOLS				
COA Comparitor	DPL	User	Available as COTS	1
MOE Calculator	VSS	Joint M&S	Common need	3
Communications Analysis Tool		Joint M&S	Common need	3
Disaster and Other Specialized Impact Models	CMS, various	Joint M&S	Common support	3
COST MODELS		Joint M&S	Common need	3
INFORMATION TOOLS				
Situation Display	Anchor Desk	Joint M&S	Common need, linked to GCCS	2
Data Warehouse	JDS	JAMIP	Common need for data and access	1

4. CONCLUSION

Currently, there are two credible MTW scenarios. One or both of these involve the strong possibility of a collapse of the potential aggressor state, with a resulting failed-state OOTW scenario. Should this occur, military analysts face a potentially long period (before the rise of an alternate aggressor state) in which not only are the majority of actual operations of an OOTW type, but also the only credible scenarios are of OOTWs. The CINCs together plan for the estimated 40 - 50 OOTWs that take place each year [9], and for an unknown number of OOTWs that are averted or not responded to by the United States. The importance of OOTW analysis at the long-term planning and programming level is evidenced by the large plurality of OOTW vignettes that were included in the recent Quadrennial Defense Review (QDR).

Most of the OOTW analysis requirements will necessitate concerted, coordinated joint M&S support to secure the appropriate enabling tools. Two of the tools (and parts of two others) can be directly provided by JWARS. One tool can be acquired as a COTS product. Most of the other tools, except impact analysis, require only concerted, jointly-directed efforts.

Impact analysis is the critical facility for concept and doctrine development and analysis, for systems effectiveness and trade-off analysis, and for force assessment. It is also critical for valid assessments in the execution planning phase of crisis action planning. Each of these areas requires a tool that exposes any difference in results from the use of different concepts of employment, doctrine, force structures, or availability of systems. The **impact** of the differences in input **must** be affected by the relevant environment. In the case of OOTW, the environment consists of the political, economic, physical, medical, agricultural, and military interactions. Research and analysis are required to determine how to model these interactions. JWARS will not contain this functionality. Thus, questions concerning the overall value or impact (beyond consumption of, or competition for, resources and sufficiency for any potential combat operations) of an operation depend on connections to the politico-economic-social environment and must be addressed by an impact simulation or assessment tool.

The recommendations of Section 3 can be restated as nine broad recommendations. Five of the recommendations involve simulation (and thus relate to JWARS):

- OOTW-originated Military Contingency Operations (MCOs), including SOF, should be modeled in JWARS (subject to scale considerations);
- Peace Operations (PO), Humanitarian Assistance/Disaster Relief (HA/DR), and National Integrity (NI) operations should be modeled in JWARS when (or if) they transition to combat SSCs;
- JWARS should model the resource consumption and sequestration activities (transportation, logistics, etc.) of all OOTWs (subject to scale considerations);

- the JWARS Joint Data Support (JDS) should include OOTW data needs; and
- an OOTW impact analysis simulation should (for the time being) be included in research simulations external to JWARS.

Four additional recommendations are independent of the simulation domain:

- an integrated mission planning tool for OOTWs is needed, can be created with a concerted effort, and should be developed promptly;
- an overview or meta-tool is needed to connect the crisis action team to the existing set of disaster analysis tools;
- no additional action is currently required in acquiring cost tools, as this action is underway; and
- the definition for the situation display tool should evolve with the definitions of the other tools that create information to be displayed.

This document has identified the connections between the required OOTW analytic tools and JWARS; however, the specifications for those tools that are not satisfied by JWARS are incomplete. The detailed specifications of the mission planning tools, the impact simulation and indicators and warnings tools, and the support tools can be developed. Three general approaches to developing the specifications have been identified: collaborative experiments, workshops, and task-order projects. These approaches may be viewed as alternatives or as supplementary tasks.

Two collaborative experiments are described that would identify the values and shortcomings of existing tools. The concept behind these experiments is that the best way to define problems and solutions is to observe an attempt to analyze a real (or projected) OOTW situation and record the results.

The second approach consists of a series of workshops that would further the creation of the tools. The sequence of the meeting topics is based on the potential for early success and the priorities set by the prospective users. The first meeting is a workshop to define the specifications for mission planning tools. The second meeting is a conference on the theory and practical aspects of creating an impact simulation and an indicators and warning tool. The third meeting is a "show and tell" conference on OOTW analysis support tools in the area of disaster impact that have been produced within and external to the Department of Defense.

An alternative to this last conference is a task-order project to investigate, develop specifications and report on disaster impact tools.

These three approaches are elaborated in Appendix A.

Analysis in an OOTW context is proceeding now, without the tools described here. Clearly, U.S. analysts can "make do" without these tools; however, they have strongly asserted [9] and

[15] that their analyses can be produced more quickly with the aid of these tools and that the results will be more reliable. Prudence dictates the creation of dedicated tools for the immediate support OOTW analysis. Most of the tools can be created, with only modest funding support, in a reasonably short time. Doing so would be a wise investment of resources. Prudence also dictates that JWARS should contain the hooks necessary to add additional OOTW functionality in the future with minimal cost.

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APPENDIX A:
IMPLEMENTATION PLAN

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IMPLEMENTATION PLAN

This document has identified the connections between the required OOTW analytic tools and JWARS; however, the specifications for those tools that are not satisfied by JWARS are incomplete. The cost tools are not covered here, as they are being addressed in more specialized environments. The information tools, situation display and data warehouse, are also not covered because they will require the results described here as input to their specifications. This appendix presents plans for completing the detailed specifications of the mission planning tools, the impact simulation, and indicators and warnings tools, and the support tools. Fig. 22 indicates the approximate timing of the workshop alternative for completing the specifications, as compared to the JWARS timeline. The shorter numbered arrows represent the workshop plans discussed below, while the longer numbered arrows represent the implementation (programming, etc.) of the specifications. Similar timelines would be appropriate for the collaborative experiment alternatives for generating specifications.

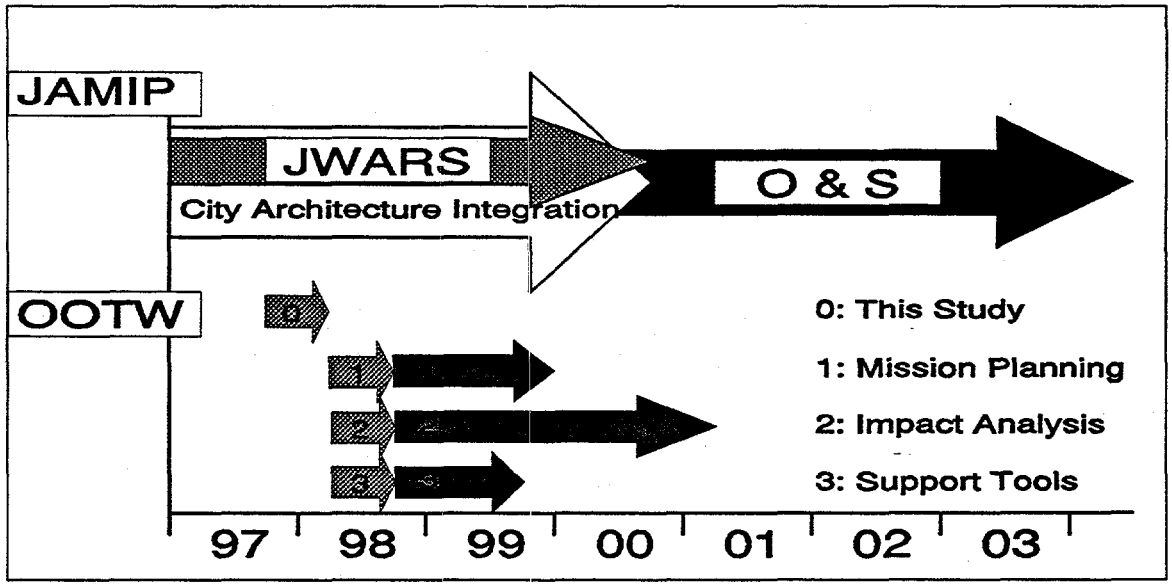

Fig. 22. Implementation timeline.

A.1 MISSION PLANNING

The CAPS, JEB, and FAST-OR tools have been identified as potential starting points for creating the force design and logistics requirements parts of mission planning; however, they are also known to be incomplete in several respects. Similarly, the CMPO tool has been identified as a potential tool for mission definition and task analysis; however, it is also incomplete. The GCMP tool has been identified as a valuable technique for implementing a task analysis tool; however, it is a technique for creating a tool, not the tool itself. Two

alternatives have been identified for developing the necessary tool: a failed state HA planning experiment and a mission planning workshop.

A.1.1 Failed State HA Planning Experiment - Part A

The concept is to use a case study method to examine and assess high interest OOTW related programmatic and planning issues. A scenario has been chosen that is of interest to OSD, J-8, the Services, and at least one CINC. This scenario involves humanitarian assistance to a large failed state. The scope will consist of a spectrum of issues to be identified by the stakeholders. The objectives are two-fold: a decision maker focus and an analyst focus. For example, the decision maker focus would be to identify resource requirements/implications, examine the use of non-DoD assets, and gain a broader understanding of non-traditional missions. The analyst focus would be to assess analytic support methodologies, determine the values and shortcomings of current tools, and determine how to analyze OOTWs (questions, data, and processes).

The portion of this case study of direct interest to this report, particularly this section, involves the analyst focus on the capabilities and shortcomings of the mission planning tools. The study would identify and develop data requirements and sources and identify methodologies/tools to support analyses. The study would include documentation of procedures, work-arounds and results.

A.1.2 Mission Planning Workshop

A workshop, attended by the prospective users of the mission planning tools, is required to create the detailed specifications. The concept is for a three day workshop, with an initial half day spent on mission definition and task analysis, followed by two half days on force design, a half day on logistics requirements, and concluding with a half day spent revisiting mission definition and task analysis. Following the workshop, a volume documenting the proceedings and the results (tool specifications) will be prepared.

Initial reading material would consist of the mission planning tools definitions from this report (Section 3.4). Each of the four elements of mission planning that are addressed (mission definition, task analysis, force design, and logistics requirements) would be discussed in two parts (general breakout session and specification session). The central points that should be considered in each are listed below.

Mission definition structured questions

- What are the reasons for performing mission definition? What are the time restrictions? (If there is a significant bifurcation, consult with the other group to split the work load.)

- What is known prior to beginning mission definition? Where is this information available?

- What is the environment (location, facilities, multiple groups, etc.) in which mission definition is carried out?

- What is the proper sequence for creating a mission definition?
- What decisions must be made by the analyst? What decisions must be referred to others?
- What information must be gathered during the process of mission definition (dependencies)? Where is it found?
- What cost information should be created?
- What information will be available to pass to task analysis?

Task analysis definition structured questions

- What are the reasons for performing task analysis? What are the time restrictions? (If there is a significant bifurcation, consult with the other group to split the work load.)
- What is known prior to beginning task analysis? Where is this information available?
- What is the environment (location, facilities, multiple groups, etc.) in which task analysis is carried out?
- What is the proper sequence for creating a task analysis?
- What decisions must be made by the analyst? What decisions must be referred to others?
- What information must be gathered during the process of task analysis (dependencies)? Where is it found?
- What cost information should be created?
- What information will be available to pass to force design?

Force design structured questions

- What are the reasons for performing force design? What are the time restrictions? (If there is a significant bifurcation, consult with the other group to split the work load.)
- What is known prior to beginning force design? Where is this information available?
- What is the environment (location, facilities, multiple groups, etc.) in which force design is carried out?

- What is the proper sequence for creating a force design?
- What decisions must be made by the analyst? What decisions must be referred to others?
- What information must be gathered during the process of force design (dependencies)? Where is it found?
- How should feedback from the transport analysis from JFAST or MIDAS/JWARS be handled?
- What cost information should be created?
- What information will be available to pass to logistics requirements?

Force design specification structured questions

- Define overall program flow.
- Define decision points and the nature of the decision criteria.
- Define data requirements.
- Define output requirements.

Logistics requirements structured questions

- What are the reasons for performing logistics requirements? What are the time restrictions? (If there is a significant bifurcation, consult with the other group to split the work load.)
- What is known prior to beginning logistics requirements? Where is this information available?
- What is the environment (location, facilities, multiple groups, etc.) in which logistics requirements is carried out?
- What is the proper sequence for creating a logistics requirements?
- What decisions must be made by the analyst? What decisions must be referred to others?
- What information must be gathered during the process of logistics requirements (dependencies)? Where is it found?
- How should feedback from the transport analysis from JFAST or MIDAS/JWARS be handled?

- What cost information should be created?
- What information will be available to pass on?

Logistics requirements specification structured questions

- Define overall program flow.
- Define decision points and the nature of the decision criteria.
- Define data requirements.
- Define output requirements.

Mission definition specification structured questions

- Revisit the mission definition answers in light of the requirements for task analysis and succeeding steps and change the answers if necessary.
- Decide whether the program should be computer-based or paper based.
- Define overall program flow.
- Define decision points and the nature of the decision criteria.
- Define data requirements.
- Define output requirements.

Task analysis definition specification structured questions

- Revisit the task analysis answers in light of the requirements for force design and succeeding steps and change the answers if necessary.
- Decide whether the program should be computer-based or paper based.
- Define overall program flow.
- Define decision points and the nature of the decision criteria.
- Define data requirements.
- Define output requirements.

The final document should begin with an introduction describing the goals and structure of the workshop. The reported tool specifications should be recast into a common format emphasizing both the details that were successfully specified and any that were omitted. The

conclusion should describe the level of success achieved and the tasks remaining in the creation of the tools.

A.2 IMPACT SIMULATION AND INDICATORS & WARNINGS

The Impact Simulation and the Indicators & Warnings (I&W) tool require considerable thought from a diverse group of analysts, theoreticians, and personnel with operational experience. Two alternatives have been identified for developing the necessary tools: a failed state HA planning experiment and an impact simulation and I&W workshop.

A.2.1 Failed State HA Planning Experiment - Part B

The same experiment described in the mission planning section above would be used to evaluate impact simulations and I&W tools. The study would identify and develop data requirements and sources and identify methodologies/tools to support analyses. The study would include documentation of procedures, work-arounds and results.

A.2.2 Impact Simulation and I&W Conference

While the I&W tool can be initiated relatively quickly, the inputs and thought processes required for its development are closely related to those of the Impact Simulation. A conference to bring together the requisite people is the proper venue to begin the research process.

The solicitation for theoretical presentations will ask for papers on the proper factors that must be considered, the theoretical and experimental evidence supporting relationships among factors, and technical concepts for modeling the factors, both as impact simulations and I&W tools. The solicitation for practical presentations will ask for papers on methods for implementing models and tools, appropriate graphical user interfaces, symbology, data input, output analysis, etc. Submissions in both categories by a single individual or group will be welcomed.

A two day, single-tracked conference should be adequate to allow the exposition of ideas. The conference should be divided into two segments, theoretical and practical. All presentations would be reviewed prior to acceptance. Presentations would be allocated 30 minute time slots. Initial reading material will consist of the Impact Simulation and I&W definitions from this report (Section 3.3).

Following the workshop, a volume documenting the proceedings and the results (research recommendations and tool specifications) would be prepared. The document would begin with an introduction describing the goals and structure of the conference. This introduction would be followed by the contents of the keynote address. The presentations would be included, grouped in a logical manner. The conclusion would describe the level of success achieved and the tasks remaining in the creation of the tools.

A.3 SUPPORT TOOLS FOR OOTW

The support tools for OOTW consist of a diverse group of tools, many created and used by organizations outside the Department of Defense. The concept is to identify the required set of disaster relief tools (those that exist, those that can be accessed rapidly [and how this can be done in an operational context], those that require smaller, approximating tools for quick response) and to identify means of making the tools useful in a crisis response situation. Table 13 shows a sampling of the requirements. Three alternatives have been identified for developing the necessary tool: a disaster relief crisis response experiment, a support tools project, and a support tools workshop.

Table 13. Disaster & Other Specialized Impact Models

- Natural
  - flood
  - drought
  - earthquake
  - volcano
  - fires (forest, urban)
  - hurricane
- Human Causes
  - WMD
  - oil spills
  - industrial accidents
  - nuclear accident
- Data Questions
  - demographics
  - geography
  - cultural factors
- Medical
  - famine
  - epidemics
- Sources: DSWA, DOE, FEMA, DoD, etc.

A.3.1 Disaster Relief Crisis Response Experiment

The concept is to use a case study method to examine and assess high interest OOTW related programmatic and planning issues. A scenario set would be chosen that is of interest to the Services, and the CINCs. These scenarios would involve crisis responses to disasters. The scope will consist of a spectrum of issues to be identified by the stakeholders. The objectives are two-fold: a decision maker focus and an analyst focus. For example, the decision maker focus would be to identify resource requirements/implications, examine the use of non-DoD assets, and gain a broader understanding of non-traditional missions. The analyst focus would be to assess analytic support methodologies, determine the values and shortcomings of current tools, and determine how to analyze OOTWs (questions, data, and processes).

The portion of this case study of direct interest to this report, particularly this section, involves the analyst focus on the capabilities and shortcomings of the disaster planning tools. The study would identify and develop data requirements and sources and identify methodologies/tools to support analyses. The study would include documentation of procedures, work-arounds and results.

A.3.2 Support Tools Project

The concept of a support tools project is to task an individual with the requisite knowledge to directly identify the required information and define the specifications for further work.

A.3.3 Support Tools Conference

A conference is needed to bring the diverse group of tool creating organizations together with the prospective users. The format would consist of formal presentations by tool proponents and informal demonstrations of working tools. Initial reading material would consist of the Support Tools definitions from this report (Section 3.5).

Following the workshop, a volume documenting the proceedings and the results (recommended actions) would be prepared. The document would begin with an introduction describing the goals and structure of the conference. The presentations would be included, grouped in a logical manner. Any tools that were demonstrated without a formal presentation would also be briefly described. The conclusion would describe the level of success achieved and the tasks remaining prior to any use of the tools.

APPENDIX B:
OOTW UJTL TASKS

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OOTW UJTL TASKS

These tasks have been excerpted from the Joint Mission Essential Tasks List (JMETL) that was created from the UJTL [13] for OOTWs [9]. They contain the strategic theater (ST) and operational (OP) tasks, appropriate to the CINC planning cells' needs for OOTW. In addition, certain strategic national (SN) tasks are called out as relating to analysis tasks for OOTW. Tasks that were recommended to be inserted in the UJTL to accommodate OOTWs are shown in italics.

The tasks are listed within each tool by UJTL sequence number. The breadth column denotes then number of OOTW categories served by each task - the breadth of the task within the entire OOTW context. (The maximum breadth is 10.)

The tasks that have been identified for full support in JWARS, either in the Initial Operating Capability (IOC) or Full Operating Capability (FOC), by the Integrated Product Team (IPT) creating the ORD [10] are shown in bold face within the Resource Simulation tool section. The remaining tasks in the Resource Simulation tool should be easily supportable by JWARS in the reduced functionality required for resource simulation because not all parts of each task need to be modeled, only enough to answer the resources question.

Within the Integrated Mission Planning tool sections, the UJTL tasks are listed only for the first tool in which they are relevant. Thus each task is logically present in each of the succeeding tools within the group.

Table 14. UJTL applicability to OOTW tools

UJTL #	UJTL TASK	Tool	Priority	Breadth
SN 5.1.4	Monitor Worldwide Strategic Situation	1.1 Indicators & Warnings	1	10
SN 5.2	REASSESS WORLDWIDE AND REGIONAL STRATEGIC ENVIRONMENT	1.1 Indicators & Warnings	1	10
ST 2.4.1.1	Identify theater issues & threats	1.1 Indicators & Warnings	1	10
ST 2.4.1.3	*Produce instability forecast for theater area of interest*	1.1 Indicators & Warnings	1	9
ST 2.4.2.1	Provide theater strategic indications & warnings	1.1 Indicators & Warnings	1	10
OP 2.4.1.1	Identify operational issues & threats	1.1 Indicators & Warnings	1	10
OP 2.4.1.3	*Identify centers of gravity*	1.1 Indicators & Warnings	1	8
OP 2.4.2.1	Provide indications & warning for theater of operations/JOA	1.1 Indicators & Warnings	1	10

Table 14. UJTL applicability to OOTW tools				
UJTL #	**UJTL TASK**	**Tool**	**Priority**	**Breadth**
SN 5.1.4	Monitor Worldwide Strategic Situation	1.2 Impact Simulation	1	10
SN 5.2	REASSESS WORLDWIDE AND REGIONAL STRATEGIC ENVIRONMENT	1.2 Impact Simulation	1	10
ST 2.4.1.1	Identify theater issues & threats	1.2 Impact Simulation	1	10
ST 2.4.1.2	Determine enemy's theater strategic capabilities	1.2 Impact Simulation	1	7
ST 2.4.1.3	*Produce instability forecast for theater area of interest*	1.2 Impact Simulation	1	9
ST 2.4.1.4	*Produce impact forecast for proposed plans*	1.2 Impact Simulation	1	10
ST 2.4.1.5	*Evaluate risks & 'worst case'*	1.2 Impact Simulation	1	7
ST 2.4.2.1	Provide theater strategic indications & warnings	1.2 Impact Simulation	1	10
ST 3.1.1	Select Strategic Targets in the Theater for Attack	1.2 Impact Simulation	1	2
ST 5.3.1.4	*Estimate probability of mission success*	1.2 Impact Simulation	1	10
OP 1.1.2	Conduct Intratheater Deployment & Redeployment of Forces Within Theater of Operations/JOA	1.2 Impact Simulation	1	10
OP 1.2.3	Concentrate Forces in Theater of Operations/JOA	1.2 Impact Simulation	1	10
OP 2.3.3.1	Develop enemy operational intentions	1.2 Impact Simulation	1	7
OP 2.4.1.1	Identify operational issues & threats	1.2 Impact Simulation	1	10
OP 2.4.1.2	Determine enemy's operational capabilities & course of action	1.2 Impact Simulation	1	8
OP 2.4.1.3	*Identify centers of gravity*	1.2 Impact Simulation	1	8
OP 2.4.2.1	Provide indications & warning for theater of operations/JOA	1.2 Impact Simulation	1	10
OP 3.1.3	Develop Operational Targets	1.2 Impact Simulation	1	5
OP 3.1.4	Prioritize High Payoff Targets	1.2 Impact Simulation	1	5
OP 5.3.1.3	*Estimate probability of success*	1.2 Impact Simulation	1	10
OP 5.3.1.4	*METT-T*	1.2 Impact Simulation	1	10
OP 5.3.5	Analyze Courses of Action	1.2 Impact Simulation	1	10
SN 1.1	**DETERMINE TRANSPORTATION INFRASTRUCTURE AND RESOURCES**	1.3 Resource Simulation	1	10
SN 4	**PROVIDE SUSTAINMENT**	1.3 Resource Simulation	1	10
ST 1.1.1.1	*Determine transport capabilities*	1.3 Resource Simulation	1	10
ST 2.1	**PLAN & DIRECT THEATER STRATEGIC INTELLIGENCE ACTIVITIES** [add emphasis on political & social situations, animosities, etc.]	1.3 Resource Simulation	1	10

Table 14. UJTL applicability to OOTW tools				
UJTL #	UJTL TASK	Tool	Priority	Breadth
ST 2.2	COLLECT THEATER STRATEGIC INFORMATION	1.3 Resource Simulation	1	10
ST 3.2.2.1	Conduct theater psychological activities	1.3 Resource Simulation	1	9
ST 4.2.2	Provide Health Service Support	1.3 Resource Simulation	1	10
ST 4.2.3	Reconstitute Theater Forces	1.3 Resource Simulation	1	10
ST 4.3.1	Provide Movement Services within AOR	1.3 Resource Simulation	1	10
ST 4.3.2	Provide Supplies & Services for Theater Forces	1.3 Resource Simulation		10
ST 4.4.2	Provide Civil-Military Engineering in Theater	1.3 Resource Simulation	1	9
ST 5.1	OPERATE & MANAGE COMMUNICATIONS & INFORMATION SYSTEMS	1.3 Resource Simulation	1	10
ST 5.5	EMPLOY THEATER-WIDE COMMAND & CONTROL WARFARE [PSYOPs]	1.3 Resource Simulation	1	9
ST 5.6	PROVIDE PUBLIC AFFAIRS IN THEATER	1.3 Resource Simulation	1	10
ST 6.2.5.3	Secure & protect theater air, land & sea LOCs	1.3 Resource Simulation	1	9
ST 7.1.1	Provide OPLANS for Mobilization & Deployment Planning & Execution	1.3 Resource Simulation	1	10
ST 7.1.3	Tailor Joint Forces for Deployment	1.3 Resource Simulation	1	10
ST 7.1.3.1	*Determine deployment timing*	1.3 Resource Simulation	1	10
ST 7.1.3.2	*Determine deployment priorities*	1.3 Resource Simulation	1	10
ST 7.1.3.3	*Determine tooth to tail ratio*	1.3 Resource Simulation	1	10
ST 7.1.4.1	*Determine redeployment priorities: effectiveness vs availability/ feasibility*	1.3 Resource Simulation	1	10
ST 7.1.6.1	*Determine force structure, heavy vs light forces, weapons mix*	1.3 Resource Simulation	1	10
ST 7.1.6.2	*Determine active/reserve mix to meet force requirements, to include tailoring*	1.3 Resource Simulation	1	10
ST 7.2.1	Maintain & Report Force Readiness	1.3 Resource Simulation	1	10
ST 8.2.1	Conduct Security Assistance Activities	1.3 Resource Simulation	1	7
ST 8.2.2	Conduct Civil Affairs in Theater	1.3 Resource Simulation	1	8
ST 8.2.3	Coordinate Foreign Disaster Relief	1.3 Resource Simulation	1	7
ST 8.2.4	Provide Humanitarian Assistance	1.3 Resource Simulation	1	8
ST 8.2.5	Provide Nation Assistance Support	1.3 Resource Simulation	1	7
ST 8.2.6	Provide Military Civic Action Assistance	1.3 Resource Simulation	1	8
ST 8.2.7	Assist in Restoration of Order	1.3 Resource Simulation	1	8
ST 8.2.8	Support Peace Operations in Theater	1.3 Resource Simulation	1	2

Table 14. UJTL applicability to OOTW tools				
UJTL #	**UJTL TASK**	**Tool**	**Priority**	**Breadth**
ST 8.2.9	Coordinate Theater Foreign Internal Defense Activities	1.3 Resource Simulation	1	1
ST 8.2.10	**Coordinate Multinational Operations Within AOR**	1.3 Resource Simulation	1	10
ST 8.2.11	Cooperate With & Support NGOs in AOR	1.3 Resource Simulation	1	10
ST 8.2.12	Cooperate With & Support PVOs in AOR	1.3 Resource Simulation	1	10
ST 8.4.1	Advise & Support Counterdrug Operations in Theater	1.3 Resource Simulation	1	4
ST 8.4.2	**Assist in Combatting Terrorism**	1.3 Resource Simulation	1	4
ST 8.4.3	**Coordinate Evacuation of Noncombatants from Theater**	1.3 Resource Simulation	1	6
ST 8.4.4	**Counter Weapon & Technology Proliferation**	1.3 Resource Simulation	1	5
ST 8.4.5	Coordinate Military Support to Civil Authorities (MSCA)	1.3 Resource Simulation	1	2
ST 8.5	COORDINATE & INTEGRATE REGIONAL INTERAGENCY ACTIVITIES	1.3 Resource Simulation	1	10
OP 1.1.3.1	*Maintain tooth to tail ratio*	1.3 Resource Simulation	1	10
OP 1.2.4.1	**Plan & execute show of force**	1.3 Resource Simulation	1	5
OP 1.2.4.3	**Conduct forcible entry: airborne, amphibious & air assaults**	1.3 Resource Simulation	1	3
OP 1.2.4.5	**Conduct raids in JOA**	1.3 Resource Simulation	1	2
OP 1.2.4.7	**Conduct direct actions in JOA**	1.3 Resource Simulation	1	2
OP 1.2.4.8	**Conduct unconventional warfare in theater of operations/JOA**	1.3 Resource Simulation	1	2
OP 1.4.2	**Plan & Execute Quarantine/Embargo**	1.3 Resource Simulation	1	6
OP 1.4.3	**Plan & Execute Blockade**	1.3 Resource Simulation	1	6
OP 1.4.4	**Plan & Execute Maritime Interception**	1.3 Resource Simulation	1	5
OP 2.1	**DETERMINE & DIRECT OPERATIONAL INTELLIGENCE ACTIVITIES**	1.3 Resource Simulation	1	10
OP 2.2	**COLLECT OPERATIONAL INFORMATION**	1.3 Resource Simulation	1	10
OP 2.4.1.4	*Identify infrastructure improvement requirements*	1.3 Resource Simulation	1	4
OP 2.4.3	***Estimate readiness***	1.3 Resource Simulation	1	10
OP 3.2.2.1	**Employ PSYOP in theater of operations/JOA**	1.3 Resource Simulation	1	9
OP 4.4.3	**Provide for Health Services in Theater of Operations/JOA**	1.3 Resource Simulation	1	10
OP 4.4.3.2	**Manage flow of casualties in theater of operations/JOA**	1.3 Resource Simulation	1	10

Table 14. UJTL applicability to OOTW tools				
UJTL #	**UJTL TASK**	**Tool**	**Priority**	**Breadth**
OP 4.4.3.3	**Manage health services resources in theater of operations/JOA**	1.3 Resource Simulation	1	10
OP 4.4.5.1	*Conduct mission rehearsals*	1.3 Resource Simulation	1	3
OP 4.5.1	**Provide for Movement Services in Theater of Operations/JOA**	1.3 Resource Simulation	1	10
OP 4.5.2	**Supply Operational Forces**	1.3 Resource Simulation	1	10
OP 4.6.2	**Provide Civil-Military Engineering**	1.3 Resource Simulation	1	9
OP 4.6.4	**Provide Law Enforcement & Prisoner Control**	1.3 Resource Simulation	1	8
OP 4.7.1	Provide Security Assistance in Theater of Operations/JOA	1.3 Resource Simulation	1	8
OP 4.7.2	**Coordinate & Provide CMO Support in Theater of Operations/JOA**	1.3 Resource Simulation	1	9
OP 4.7.2.1	*Support humanitarian operations*	1.3 Resource Simulation	1	9
OP 4.7.2.2	*Provide indigenous/client/refugee support*	1.3 Resource Simulation	1	10
OP 4.7.3	**Provide Support to DoD & Other Government Agencies**	1.3 Resource Simulation	1	10
OP 4.7.5	Coordinate Politico-Military Support	1.3 Resource Simulation	1	10
OP 4.7.6	**Coordinate Civil Affairs in Theater of Operations/JOA**	1.3 Resource Simulation	1	8
OP 5.1	**ACQUIRE & COMMUNICATE OPERATIONAL LEVEL INFORMATION & MAINTAIN STATUS**	1.3 Resource Simulation	1	10
OP 5.8	PROVIDE PUBLIC AFFAIRS IN THEATER OF OPERATIONS/JOA	1.3 Resource Simulation	1	10
OP 6.2	**PROVIDE PROTECTION FOR OPERATIONAL FORCES, MEANS & NONCOMBATANTS**	1.3 Resource Simulation	1	10
OP 6.5.4	**Protect & Secure Air, Land & Sea LOCs in Theater of Operations/JOA**	1.3 Resource Simulation	1	9
SN 5.3	DETERMINE NATIONAL MILITARY STRATEGIC DIRECTION	2.1 Mission Definition	2	10
ST 5.2.1	Review Current Situation	2.1 Mission Definition	2	10
ST 5.3.2.1	*Identify firm mission elements & elements in flux*	2.1 Mission Definition	2	10
ST 5.3.2.2	*Identify transition criteria*	2.1 Mission Definition	2	10
ST 5.4.1	Issue Theater Strategic Operations Plans, Orders & ROE	2.1 Mission Definition	2	10
ST 5.4.3.1	Augment the joint force staff	2.1 Mission Definition	2	10

Table 14. UJTL applicability to OOTW tools				
UJTL #	**UJTL TASK**	**Tool**	**Priority**	**Breadth**
ST 5.4.3.2	Activate theater boards, committees & cells	2.1 Mission Definition	2	10
OP 2.2.2.1	*Activate HAST*	2.1 Mission Definition	2	1
OP 4.7.4	Plan & Transition to Civil Authorities	2.1 Mission Definition	2	9
OP 5.3.1.1	*Develop mission*	2.1 Mission Definition	2	10
OP 5.3.1.2	*Develop MOEs for mission*	2.1 Mission Definition	2	10
OP 5.3.3	Determine Operational End State	2.1 Mission Definition	2	10
OP 5.4.3	Provide Rules of Engagement	2.1 Mission Definition	2	10
OP 5.5	ORGANIZE A JOINT TASK FORCE	2.1 Mission Definition	2	10
OP 5.5.1.1	*Establish command arrangements & span of control*	2.1 Mission Definition	2	10
OP 5.5.2	Develop Joint Force Liaison Structure	2.1 Mission Definition	2	10
OP 5.5.5	Establish Command Transition Criteria & Procedures	2.1 Mission Definition	2	9
ST 2.1	PLAN & DIRECT THEATER STRATEGIC INTELLIGENCE ACTIVITIES [add emphasis on political & social situations, animosities, etc.]	2.2 Task Analysis	1	10
ST 2.2	COLLECT THEATER STRATEGIC INFORMATION	2.2 Task Analysis	1	10
ST 3.2.2.1	Conduct theater psychological activities	2.2 Task Analysis	1	9
ST 4.2.2	Provide Health Service Support	2.2 Task Analysis	1	10
ST 4.4.2	Provide Civil-Military Engineering in Theater	2.2 Task Analysis	1	9
ST 5.1	OPERATE & MANAGE COMMUNICATIONS & INFORMATION SYSTEMS	2.2 Task Analysis	1	10
ST 5.5	EMPLOY THEATER-WIDE COMMAND & CONTROL WARFARE [PSYOPs]	2.2 Task Analysis	1	9
ST 5.6	PROVIDE PUBLIC AFFAIRS IN THEATER	2.2 Task Analysis	1	10
ST 6.2.5.3	Secure & protect theater air, land & sea LOCs	2.2 Task Analysis	1	9
ST 8.2.1	Conduct Security Assistance Activities	2.2 Task Analysis	1	7
ST 8.2.2	Conduct Civil Affairs in Theater	2.2 Task Analysis	1	8
ST 8.2.3	Coordinate Foreign Disaster Relief	2.2 Task Analysis	1	7
ST 8.2.4	Provide Humanitarian Assistance	2.2 Task Analysis	1	8
ST 8.2.5	Provide Nation Assistance Support	2.2 Task Analysis	1	7
ST 8.2.6	Provide Military Civic Action Assistance	2.2 Task Analysis	1	8
ST 8.2.7	Assist in Restoration of Order	2.2 Task Analysis	1	8
ST 8.2.8	Support Peace Operations in Theater	2.2 Task Analysis	1	2

Table 14. UJTL applicability to OOTW tools				
UJTL #	**UJTL TASK**	**Tool**	**Priority**	**Breadth**
ST 8.2.9	Coordinate Theater Foreign Internal Defense Activities	2.2 Task Analysis	1	1
ST 8.2.10	Coordinate Multinational Operations Within AOR	2.2 Task Analysis	1	10
ST 8.2.11	Cooperate With & Support NGOs in AOR	2.2 Task Analysis	1	10
ST 8.2.12	Cooperate With & Support PVOs in AOR	2.2 Task Analysis	1	10
ST 8.4.1	Advise & Support Counterdrug Operations in Theater	2.2 Task Analysis	1	4
ST 8.4.2	Assist in Combatting Terrorism	2.2 Task Analysis	1	4
ST 8.4.3	Coordinate Evacuation of Noncombatants from Theater	2.2 Task Analysis	1	6
ST 8.4.4	Counter Weapon & Technology Proliferation	2.2 Task Analysis	1	5
ST 8.4.5	Coordinate MSCA	2.2 Task Analysis	1	2
ST 8.5	COORDINATE & INTEGRATE REGIONAL INTERAGENCY ACTIVITIES	2.2 Task Analysis	1	10
OP 2.1	DETERMINE & DIRECT OPERATIONAL INTELLIGENCE ACTIVITIES	2.2 Task Analysis	1	10
OP 2.2	COLLECT OPERATIONAL INFORMATION	2.2 Task Analysis	1	10
OP 2.4.1.4	*Identify infrastructure improvement requirements*	2.2 Task Analysis	1	4
OP 3.2.2.1	Employ PSYOP in theater of operations/JOA	2.2 Task Analysis	1	9
OP 4.4.3	Provide for Health Services in Theater of Operations/JOA	2.2 Task Analysis	1	10
OP 4.4.3.2	Manage flow of casualties in theater of operations/JOA	2.2 Task Analysis	1	10
OP 4.4.3.3	Manage health services resources in theater of operations/JOA	2.2 Task Analysis	1	10
OP 4.4.5.1	*Conduct mission rehearsals*	2.2 Task Analysis	1	3
OP 4.6.2	Provide Civil-Military Engineering	2.2 Task Analysis	1	9
OP 4.6.4	Provide Law Enforcement & Prisoner Control	2.2 Task Analysis	1	8
OP 4.7.1	Provide Security Assistance in Theater of Operations/JOA	2.2 Task Analysis	1	8
OP 4.7.2	Coordinate & Provide CMO Support in Theater of Operations/JOA	2.2 Task Analysis	1	9
OP 4.7.2.1	*Support humanitarian operations*	2.2 Task Analysis	1	9
OP 4.7.2.2	*Provide indigenous/client/refugee support*	2.2 Task Analysis	1	10
OP 4.7.3	Provide Support to DoD & Other Government Agencies	2.2 Task Analysis	1	10
OP 4.7.5	Coordinate Politico-Military Support	2.2 Task Analysis	1	10

Table 14. UJTL applicability to OOTW tools				
UJTL #	**UJTL TASK**	**Tool**	**Priority**	**Breadth**
OP 4.7.6	Coordinate Civil Affairs in Theater of Operations/JOA	2.2 Task Analysis	1	8
OP 5.1	ACQUIRE & COMMUNICATE OPERATIONAL LEVEL INFORMATION & MAINTAIN STATUS	2.2 Task Analysis	1	10
OP 5.8	PROVIDE PUBLIC AFFAIRS IN THEATER OF OPERATIONS/JOA	2.2 Task Analysis	1	10
OP 6.2	PROVIDE PROTECTION FOR OPERATIONAL FORCES, MEANS & NONCOMBATANTS	2.2 Task Analysis	1	10
OP 6.5.4	Protect & Secure Air, Land & Sea LOCs in Theater of Operations/JOA	2.2 Task Analysis	1	9
ST 4.2.3	Reconstitute Theater Forces	2.3 Force Design	1	10
ST 7.1.1	Provide OPLANS for Mobilization & Deployment Planning & Execution	2.3 Force Design	1	10
ST 7.1.3	Tailor Joint Forces for Deployment	2.3 Force Design	1	10
ST 7.1.3.3	*Determine tooth to tail ratio*	2.3 Force Design	1	10
ST 7.1.6.1	*Determine force structure, heavy vs light forces, weapons mix*	2.3 Force Design	1	10
ST 7.1.6.2	*Determine active/reserve mix to meet force requirements, to include tailoring*	2.3 Force Design	1	10
ST 7.2.1	Maintain & Report Force Readiness	2.3 Force Design	1	10
OP 1.1.3.1	*Maintain tooth to tail ratio*	2.3 Force Design	1	10
OP 1.2.4.1	Plan & execute show of force	2.3 Force Design	1	5
OP 1.2.4.3	Conduct forcible entry: airborne, amphibious & air assaults	2.3 Force Design	1	3
OP 1.2.4.5	Conduct raids in JOA	2.3 Force Design	1	2
OP 1.2.4.7	Conduct direct actions in JOA	2.3 Force Design	1	2
OP 1.2.4.8	Conduct unconventional warfare in theater of operations/JOA	2.3 Force Design	1	2
OP 1.4.2	Plan & Execute Quarantine/Embargo	2.3 Force Design	1	6
OP 1.4.3	Plan & Execute Blockade	2.3 Force Design	1	6
OP 1.4.4	Plan & Execute Maritime Interception	2.3 Force Design	1	5
OP 2.4.1.5	*Establish cultural awareness*	2.3 Force Design	1	10
OP 2.4.3	*Estimate readiness*	2.3 Force Design	1	10
OP 5.3.1.4	*METT-T*	2.3 Force Design	1	10

Table 14. UJTL applicability to OOTW tools				
UJTL #	**UJTL TASK**	**Tool**	**Priority**	**Breadth**
SN 4	PROVIDE SUSTAINMENT	2.4 Logistics Analysis	1	10
ST 4.3.2	Provide Supplies & Services for Theater Forces	2.4 Logistics Analysis	1	10
OP 4.5.2	Supply Operational Forces	2.4 Logistics Analysis	1	10
SN 1.1	DETERMINE TRANSPORTATION INFRASTRUCTURE AND RESOURCES	2.5 Transport Analysis	1	10
ST 1.1.1.1	*Determine transport capabilities*	2.5 Transport Analysis	1	10
ST 4.3.1	Provide Movement Services within AOR	2.5 Transport Analysis	1	10
ST 7.1.3.1	*Determine deployment timing*	2.5 Transport Analysis	1	10
ST 7.1.3.2	*Determine deployment priorities*	2.5 Transport Analysis	1	10
ST 7.1.4.1	*Determine redeployment priorities: effectiveness vs availability/ feasibility*	2.5 Transport Analysis	1	10
OP 4.5.1	Provide for Movement Services in Theater of Operations/JOA	2.5 Transport Analysis	1	10
OP 5.2.1	Review Current Situation (Project Branches)	3.1 COA Comparitor	1	10
OP 5.3.4	Develop Courses of Action/Prepare Staff Estimates	3.1 COA Comparitor	1	10
OP 5.3.6	Compare Courses of Action	3.1 COA Comparitor	1	10
OP 5.3.7	Select or Modify Course of Action	3.1 COA Comparitor	1	10
OP 5.2.1.1	*Maintain up to date values for MOEs, probability of success & end-state status*	3.2 MOE Calculator	3	10
ST 5.1	OPERATE & MANAGE COMMUNICATIONS & INFORMATION SYSTEMS	3.3 Comm Analysis	3	10
ST 5.1.1	Communicate Strategic & Operational Decisions & Information	3.3 Comm Analysis	3	10
OP 5.1	ACQUIRE & COMMUNICATE OPERATIONAL LEVEL INFORMATION & MAINTAIN STATUS	3.3 Comm Analysis	3	10
OP 5.1.1	Communicate Operational Information	3.3 Comm Analysis	3	10
ST 4.2.2	Provide Health Service Support	3.4 Disaster Models	3	10

Table 14. UJTL applicability to OOTW tools				
UJTL #	**UJTL TASK**	**Tool**	**Priority**	**Breadth**
ST 4.4.2	Provide Civil-Military Engineering in Theater	3.4 Disaster Models	3	9
ST 8.2.2	Conduct Civil Affairs in Theater	3.4 Disaster Models	3	8
ST 8.2.3	Coordinate Foreign Disaster Relief	3.4 Disaster Models	3	7
ST 8.2.4	Provide Humanitarian Assistance	3.4 Disaster Models	3	8
ST 8.2.5	Provide Nation Assistance Support	3.4 Disaster Models	3	7
ST 8.2.6	Provide Military Civic Action Assistance	3.4 Disaster Models	3	8
ST 8.2.7	Assist in Restoration of Order	3.4 Disaster Models	3	8
ST 8.2.11	Cooperate With & Support NGOs in AOR	3.4 Disaster Models	3	10
ST 8.2.12	Cooperate With & Support PVOs in AOR	3.4 Disaster Models	3	10
OP 2.4.1.4	*Identify infrastructure improvement requirements*	3.4 Disaster Models	3	4
OP 4.4.3	Provide for Health Services in Theater of Operations/JOA	3.4 Disaster Models	3	10
OP 4.4.3.2	Manage flow of casualties in theater of operations/JOA	3.4 Disaster Models	3	10
OP 4.4.3.3	Manage health services resources in theater of operations/JOA	3.4 Disaster Models	3	10
OP 4.6.2	Provide Civil-Military Engineering	3.4 Disaster Models	3	9
OP 4.6.4	Provide Law Enforcement & Prisoner Control	3.4 Disaster Models	3	8
OP 4.7.2	Coordinate & Provide CMO Support in Theater of Operations/JOA	3.4 Disaster Models	3	9
OP 4.7.2.1	*Support humanitarian operations*	3.4 Disaster Models	3	9
OP 4.7.2.2	*Provide indigenous/client/refugee support*	3.4 Disaster Models	3	10
SN 5.2	REASSESS WORLDWIDE AND REGIONAL STRATEGIC ENVIRONMENT	4. Cost Analysis	3	10
SN 5.3	DETERMINE NATIONAL MILITARY STRATEGIC DIRECTION	4. Cost Analysis	3	10
SN 7	CONDUCT FORCE DEVELOPMENT	4. Cost Analysis	3	10
ST 5.3.1.5	*Estimate cost of mission*	4. Cost Analysis	3	10
*	Relates to all OOTW UJTL tasks	5.1 Situation Display	2	
*	Relates to all OOTW UJTL tasks	5.2 Data Warehouse	1	

APPENDIX C:
POTENTIAL OOTW TOOLS

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POTENTIAL OOTW TOOLS

The tools contained in the following tables represent potential aid to OOTW analysis, either as they stand, as prototypes to be extended into a useful tool, or as partial prototypes requiring merger with others. Table 15 shows the tools, grouped by their potential use as an OOTW tool. The tools are given an identification label (ID) (usually the acronym), have their names spelled out, have a general usage description, and are given their OOTW tool type. Tools with lower case IDs are generic or methodology tools. Table 16 supplies additional information about the tools and is sorted by ID, for ease of reference.

Table 15. Potential OOTW Analysis Tools (sorted by tool type)

ID	Tool Name	Use	OOTW Tool Type
ALADUN	Africa and Latin America Database, Unclassified	measuring expert consensus forecast, limited set of countries	1.1 Real-Time Indicators & Warnings
AS	Auto Summarizer	automatic summaries of text	1.1 Real-Time Indicators & Warnings
AVI	Assessing Vulnerability to Instability	short range (6 months) govt instability	1.1 Real-Time Indicators & Warnings
FEWS	Famine Early Warning System	famine warning	1.1 Real-Time Indicators & Warnings
GEDS	Global Events Data System	semi-automated, includes inter-state and domestic/inter-ethnic conflict	1.1 Real-Time Indicators & Warnings
GEOWARN	Global Emergency Warning and Relief Network	warnings on many types of disasters	1.1 Real-Time Indicators & Warnings
HEWS	Humanitarian Early Warning System	humanitarian crisis warning	1.1 Real-Time Indicators & Warnings
KEDS	Kansas Events Data System	automated parsing of electronic news, limited to inter-state, large volume of news coverage	1.1 Real-Time Indicators & Warnings
NAP	Normality Analysis Process		1.1 Real-Time Indicators & Warnings
PANDA	Protocol for Assessing Nonviolent Direct Action	predict "hot spots"/data, uses KEDS	1.1 Real-Time Indicators & Warnings
PERICLES	Political/Economic Risk In Countries and Lands Evaluation	cultural, ethnic strife, long range	1.1 Real-Time Indicators & Warnings
RSSIA	Regional Security Strategy Implementation Analysis	USSOUTHCOM political stability	1.1 Real-Time Indicators & Warnings
SFP	State Failure Project	multiple indicators, long range	1.1 Real-Time Indicators & Warnings
AGIS	Analysis & Gaming Information System	access to pol/econ/social info	1.2 Impact Simulation
CABLE	C3I Application Building Environment	modelling OOTW	1.2 Impact Simulation

Table 15. Potential OOTW Analysis Tools (sorted by tool type)			
ID	**Tool Name**	**Use**	**OOTW Tool Type**
COAST	Course of Action Selection Tool		1.2 Impact Simulation
CYCAM III	CyCAM III	analyze conflict trends	1.2 Impact Simulation
DEXES/CAM	Deployable Exercise Support / Civil Affairs Module	civil affairs, for training	1.2 Impact Simulation
FTLM-STOCHWARS	Future Theater Level Model - StochWars	model OOTWs	1.2 Impact Simulation
GCAM	Global Crisis Analysis Model	model OOTWs	1.2 Impact Simulation
JCM	Joint Conflict Model	operations analysis, training	1.2 Impact Simulation
RCDM	Regional Counterdrug Model	simulation of narcotics industry	1.2 Impact Simulation
RDSS	Regional Development Simulation System	OOTW analysis	1.2 Impact Simulation
sd	System Dynamics	build models	1.2 Impact Simulation
SIAM	Situational Influence Assessment Module	impact of action at a given time	1.2 Impact Simulation
SIMCITY	Sim City		1.2 Impact Simulation
SPECTRUM	Spectrum	impact of actions, instability	1.2 Impact Simulation
JWARS	Joint Warfare System		1.3 Resource Simulation
CMPO	Conceptual Model of Peace Operations	peace operations checklist	2.1 Mission Definition
FAR	Field Anomaly Relaxation	scenario generation	2.1 Mission Definition
GCMP	Graphic Crisis Management Plan	combined flowchart, checklist, rolodex	2.2 Task Analysis
HEAT	Headquarters Effectiveness Assessment Tool	models the internal processes of a headquarters	2.2 Task Analysis
JPT	JFACC Planning Tool	strategy to task analysis aid	2.2 Task Analysis
LCRS	Low Intensity Conflict Capabilities Requirements System	OOTW task list	2.2 Task Analysis
LICSTA	Low Intensity Conflict Strategies-to-Task Analysis	OOTW task list	2.2 Task Analysis
MRM	Mission Requirements Module		2.2 Task Analysis
OFP	Objective Force Planner	task-based planning methodology for OOTW mission analysis	2.2 Task Analysis
TARGET	Theater Analysis and Replanning Graphical Execution Toolkit (renamed Advanced Joint Planning)	planning missions	2.2 Task Analysis
CAPS	Contingency Analysis and Planning System	define forces are needed to achieve the military objective	2.3 Force Design

Table 15. Potential OOTW Analysis Tools (sorted by tool type)			
ID	**Tool Name**	**Use**	**OOTW Tool Type**
JEB	Joint Electronic Battlebook	resource planing	2.3 Force Design
FRPPO	Force Requirements Planner for Peace Operations	define forces needed, including for HA/DR	2.3 Force Design
TSPS	Theater Security Planning System	security planning	2.3 Force Design
DART	Dynamic Analysis and Replanning Tool	supply & services	2.4 Logistics Analysis
FAST-OR	Force Analysis Spreadsheet Tool - Operations Other Than War Requirements	non-combat units are defined and support requirements inferred, supply & services	2.4 Logistics Analysis
FASTALS		supply & services	2.4 Logistics Analysis
FDE	Force Deployment Estimator	capacity planning	2.4 Logistics Analysis
GDSS	Global Decision Support System	manifest	2.4 Logistics Analysis
HART	Humanitarian Assistance Requirements Tool	computes gap between supplies available and those needed	2.4 Logistics Analysis
KBLPS	Knowledge Based Logistics Planning Shell	supply & service, lift	2.4 Logistics Analysis
LOGGEN	Logistics Generator	logistics, capacity planning, supply & services, lift	2.4 Logistics Analysis
OLOGPLN		supply & services	2.4 Logistics Analysis
AALPS	Automated Air Load Planning System	lift	2.5 Transport Analysis
ACE/BRACE		capacity planning, lift (APOE)	2.5 Transport Analysis
AIRFLOW		lift	2.5 Transport Analysis
ALM	Air Loading Model	lift	2.5 Transport Analysis
CALMS	Computer Aided Load Manifest System	lift	2.5 Transport Analysis
CODES/ICODES	Computerized Deployment System	lift	2.5 Transport Analysis
CONOPS		lift	2.5 Transport Analysis
ELIST	Enhanced Logistics Intratheater Support Tool	capacity planning, lift	2.5 Transport Analysis
GDAS	Global Deployment Analysis System	capacity planning	2.5 Transport Analysis
GTN	Global Transportation Network	logistics, capacity planning	2.5 Transport Analysis
JFAST	Joint Flow and Analysis System for Transportation	logistics planning, capacity planning, lift	2.5 Transport Analysis
JTAV	Joint Total Asset Visibility	capacity planning, supply & services, lift	2.5 Transport Analysis

Table 15. Potential OOTW Analysis Tools (sorted by tool type)			
ID	**Tool Name**	**Use**	**OOTW Tool Type**
MIDAS	Model for Intertheater Deployment for Air and Sea	capacity planning, lift	2.5 Transport Analysis
PORTSIM	Port Simulation	capacity planning, lift (SPOE/D)	2.5 Transport Analysis
SUMMITS	Scenario Unrestricted Mobility Model for Inter Theater	capacity planning, lift	2.5 Transport Analysis
THRUPUT		lift	2.5 Transport Analysis
WPS	Worldwide Port System	manifest	2.5 Transport Analysis
DPL	Decision Programming Language	influence diagrams and decision trees	3.1 COA Comparitor
AHP	Analytical Hierarchy Process	ranking choices	3.2 MOE Calculator
spreadsheet		general calculations	3.2 MOE Calculator
VSS	Valuated State Space	special calculations	3.2 MOE Calculator
C3I-NAM	C^3I-Network Assessment Model	analyze Army communications	3.3 Communications Analysis
JINTACCS	Joint Interoperability of Tactical Command and Control Systems	database of feasible communications combinations	3.3 Communications Analysis
PRM	Power Relationship Matrix	C^2 relationships, com architecture	3.3 Communications Analysis
ACAAM	Air Courses of Action Assessment Model	air strike planning	3.4 Disaster and Other Special Impact
ASAP	All Hazards Situation Assessment Program	disaster effects	3.4 Disaster and Other Special Impact
CATS	Consequence Assessment Tool Set	results assessment	3.4 Disaster and Other Special Impact
CMASS	Counterdrug Modeling and Simulation System	counterdrug seminar game	3.4 Disaster and Other Special Impact
CMS	Crisis Management System	disaster results assessment: earthquake, flood, fire, nuclear plant release, industrial chemical release	3.4 Disaster and Other Special Impact
COMPASS	Common Operational Modeling, Planning and Simulation Strategy	simulation shell	3.4 Disaster and Other Special Impact
DIAD	Disaster Relief Anchor Desk	estimates damage and mitigation requirements	3.4 Disaster and Other Special Impact
ET	Exercise Template	disaster preparedness	3.4 Disaster and Other Special Impact
GT	Grey Team	expert system	3.4 Disaster and Other Special Impact
HDDST	Humanitarian Demining Decision Support Tool	demining support	3.4 Disaster and Other Special Impact
LOTS	Logistics Over the Shore	detailed landing model	3.4 Disaster and Other Special Impact
MEM	Mission Effectiveness Model	SOF Seal landing	3.4 Disaster and Other Special Impact
NSS	Naval Simulation System	naval intelligence	3.4 Disaster and Other Special Impact

Table 15. Potential OOTW Analysis Tools (sorted by tool type)			
ID	**Tool Name**	**Use**	**OOTW Tool Type**
PATH	Pathgames		3.4 Disaster and Other Special Impact
PLOWSHARES	Plowshares	training in disaster management	3.4 Disaster and Other Special Impact
sa	Statistical analysis packages	analyze data	3.4 Disaster and Other Special Impact
SEES	Security Exercise Evaluation System	training system for site security	3.4 Disaster and Other Special Impact
sprd	Spreadsheets	multipurpose	3.4 Disaster and Other Special Impact
sw	Seminar Wargames	intensive human interactions	3.4 Disaster and Other Special Impact
SWARM	The Swarm Simulation System	multiple objective functions, used in artificial life models	3.4 Disaster and Other Special Impact
UCCATS	Urban Combat Computer Assisted Training System	training in urban warfare	3.4 Disaster and Other Special Impact
VENICE	Venice Process	long range	3.4 Disaster and Other Special Impact
CANTELOUPES	Cost Analysis Tool to Estimate Light Operations & Unfunded Peacekeeping Scenarios		4.0 Cost
SOCBAM	Special Operations Cost Benefit Analysis Model	optimum force for cost	4.0 Cost
GCCS AD	GCCS Anchor Desk	information display and handling	5.1 Situation Display
LOG AD	Log Anchor Desk	lift	5.1 Situation Display
windows	Windows-like workstation	support system for tools	5.1 Situation Display
database	generic database system	maintains data in usable formats	5.2 Data Warehouse
JDS	Joint Data Support	maintains JWARS data in usable formats	5.2 Data Warehouse
JRAMS	Joint Readiness Automated Management System	Reserves-call up & track	5.2 Data Warehouse
JSORTS	Joint Status of Readiness and Training System	readiness, unit availability	5.2 Data Warehouse
websearch	web search agent	tool to search the Internet for specific kinds of data	5.2 Data Warehouse

Table 16. Attributes of Tools (sorted by tool ID)						
ID	**Type**	**Computer**	**Language**	**Operating System**	**Other**	**Proponent**
AALPS		Sun, VAX	Quintis, Prolog, C	UNIX		US Army Information Systems Engineering Command
ACAAM	planning support tool	Sun 4	Ada, FORTRAN, C, C++			J-8
ACE/BRACE						
AGIS	database	PC		DOS/Windows		Army War College
AHP	calculator					Saaty
AIRFLOW						
ALADUN						EBR
ALM	research & evaluation	Sun	Oracle	UNIX		Military Traffic Management Command Transportation Engineering Command (MTMCTEA)
AS		PC	Microsoft Word	Windows 95		Microsoft
ASAP						FEMA and DNA
AVI						EBR
C3I-NAM						
CABLE	programming environment				Common Object Request Broker Architecture (CORBA)	UK Centre for Defence Analysis, (+44) 1252 396212
CALMS						
CANTELOUPES						CAA
CAPS	database program	PC	Microsoft Access	Windows 95/NT	requires super VGA resolution	TRAC/J-8
CATS					developed from nuclear disaster model	FEMA/DSWA
CMASS						USSOUTHCOM
CMPO	automated checklist	PC, Sun		Windows 95, UNIX	modifications require purchase of RDD-100 at a price >$33K	Dave Davis, George Mason University
CMS	simulations	PC, ?		Windows NT, UNIX		SAIC
COAST		Sun Sparc 20				GCCS

Table 16. Attributes of Tools (sorted by tool ID)						
ID	**Type**	**Computer**	**Language**	**Operating System**	**Other**	**Proponent**
CODES/ICODES	decision support	HP 9000		UNIX		
COMPASS						DARPA
CONOPS						USAF
CYCAM III						[1]
DART	Evaluation	PC	Quick Basic	DOS		GCCS/DNA/DISN?
database	database	varies	varies	varies		
DEXES/CAM	simulation	Apple				USSOUTHCOM
DIAD	display				based on GIS	
DPL	calculator	PC	DPL	DOS/Windows		ADA, Inc
ELIST	simulation	Sun	C++	Solaris		TRANSCOM
ET						FEMA
FAR						[5]
FAST-OR	spreadsheet	PC	Excell	DOS/Windows		CAA
FASTALS	spreadsheet	PC	Excell	DOS/Windows		CAA
FDE	deployment analysis	Sun	FORTRAN	Solaris		J-8 (J-4?)
FEWS					currently Africa only	USAID, Associates in Rural Development (ARD)
FRPPO	study	N/A	N/A	N/A	incomplete study, has historical data	CAA
FTLM-STOCHWARS	simulation	PC		DOS/Windows		J-8
GCAM	programming environment					[4]
GCCS AD						GCCS
GCMP	flowchart	none				J. Berra Engineering
GDAS	simulation	PC	Paradox			CAA
GDSS						TRANSCOM
GEDS						Center for International Development and Conflict Management
GEOWARN						Marshall Spaceflight Center
GT	expert system					
GTN						

Table 16. Attributes of Tools (sorted by tool ID)						
ID	**Type**	**Computer**	**Language**	**Operating System**	**Other**	**Proponent**
HART						ANSER
HDDST						ASD SO/LIC-HRA
HEAT						
HEWS						DHA, United Nations
JCM	simulation	VAX	Ada, FORTRAN	VMS		Joint Warfighting Center
JDS	database					JAMIP
JFAST	transport analysis	PC	FoxPro and others	Windows NT		USTRANSCOM
JINTACCS						
JEB	database	PC	FoxPro	DOS/Windows		USACOM
JPT						Air Staff (checkmate)
JRAMS		Sun or HP	Oracle	UNIX		USACOM
JSORTS						
JTAV						
JWARS						
KBLPS	logistics decision support	Sun	AI	UNIX		Army CSSCS PM
KEDS						
LCRS						Booz-Allen
LICSTA						ASD SO/LIC
LOG AD						BBN
LOGGEN						
LOTS						Army Waterways Experiment Station
MEM	fuzzy expert system	PC	CubiCalc	DOS/Windows		Anthony Cowden, Sonalysts, Inc
MIDAS	simulation	Sun, PC	C++	Solaris, DOS/Windows		OSD PA&E
MRM						J7
NAP						George Rose, IFOR
NSS						Naval Postgraduate School
OFP	force requirements generator	PC	EXCELL	DOS/Windows		CAA

Table 16. Attributes of Tools (sorted by tool ID)						
ID	Type	Computer	Language	Operating System	Other	Proponent
OLOGPLN						
PANDA						[3]
PATH						
PERICLES	risk assessment	PC				CAA
PLOWSHARES	simulation	HP	FORTRAN	UNIX	developed from Janus	STRICOM
PORTSIM	simulation	Sun	MODSIM II	Solaris		MTMCTEA
PRM						Booz-Allen
RCDM						USSOUTHCOM
RDSS	training, policy analysis	MAC	Ithink			J-8, USSOUTHCOM
RSSIA						USSOUTHCOM J5
sa	statistical analysis	varies	varies	varies		
sd	simulation program	varies	System Dynamics	varies		
SEES	interactive simulation	VAX	Ada, FORTRAN	VMS		LLNL
SFP					classified	CIA
SIAM	Bayesian influence net	PC?				SAIC
SIMCITY	game					COTS
SOCBAM	linear program					SOCOM
SPECTRUM	simulation	network of PCs				National Simulation Center
sprd	spreadsheet	varies	varies	varies		
SUMMITS			FORTRAN	Multics		GRC for OSD
sw	seminar wargame					
SWARM	agent based simulation		Objective C	UNIX		The Santa Fe Institute
TARGET						Rome Laboratory
THRUPUT						USAF
TSPS						
UCCATS	interactive simulation	VAX	Ada, FORTRAN	VMS		LLNL
VENICE						UNESCO

Table 16. Attributes of Tools (sorted by tool ID)						
ID	**Type**	**Computer**	**Language**	**Operating System**	**Other**	**Proponent**
VSS	calculator					[6]
websearch	web search agent	varies	varies	varies		
windows	presentation	varies	varies	varies		
WPS						

APPENDIX D:
OOTW TASKS IMPLIED BY ANALYSIS PROCEDURES

APPENDIX D:
OOTW TASKS IMPLIED BY ANALYSIS PROCEDURES

This appendix provides a cross-walk of the analysis procedures against the OOTW tasks. Within each analysis procedure, the associated OOTW tasks (from Hartley [9]) are grouped by OOTW requirement. Each requirement is shown with its requirement number (from Table 3) and has its name capitalized. Each task within a requirement has its task number from the OOTW analysis requirements document [9] shown at the far right. These numbered connections permit a complete linkage between the recommendations of this document and the requirement derivations of the requirements document [9].

D.1 PREDICT/DETECT SITUATION

The function of this analysis procedure is to predict situations that may lead to OOTWs, including economic, cultural, military, political, and natural factors. The single OOTW analysis requirement for this analysis procedure is decomposed into OOTW tasks as follows.

IMPACT ANALYSIS {2}:

- produce the forecast of the regions of potential instability, the predicted dates, the related probabilities, and the nature of the instabilities; 1.1
- predict results, both desirable and undesirable, of all actions; and 3.14
- support response to media questions. 3.16

D.2 DEFINE SITUATION

The function of this analysis procedure is to define the values of all significant parameters of a situation that may require an OOTW. The analysis requirements for this analysis procedure are decomposed into OOTW tasks as follows.

SITUATION AWARENESS {1}: to permit a complete and accurate evaluation of the mission status, present

- instability forecasts; 1.1
- readiness of U.S. military forces, U.S. agency elements, and coalition elements; 2.6
- Intelligence, Surveillance, Reconnaissance (ISR) concerning threat, friendly and neutral elements, and environmental information; 3.10
- cultural issues; 3.11
- results of the opposing courses of action (COAs); 3.12
- results of the Mission, Enemy, Troops, Terrain/Weather and Time Available (METT-T) analysis; 3.13
- centers of gravity; 3.14

- "enemy" threat; 3.15
- casualty situation; 5.4
- infrastructure improvement requirements; and 5.5
- indigenous/client/refugee support requirements and location tracking 6.7

SITUATION AWARENESS {1}: present the definition of the situation to permit media and public affairs support. 3.16

COST ANALYSIS {9}: provide information on

- probable incremental costs to support the decision on engaging in a particular OOTW and 1.2.2
- full costs of a particular OOTW to support the Congressional Budget process. 1.2.5

(Note that these estimates of cost precision are initial estimates taken from the MORS Workshop working group on Cost Analysis [15], and are subject to revision. In particular, the cost impact on different organizations may require different levels of precision across organizations.)

D.3 DEFINE MISSION

The function of this analysis procedure is to define the overall mission and the U.S. military role. The analysis requirements for this analysis procedure are decomposed into OOTW tasks as follows.

MISSION DEFINITION AND ANALYSIS {3}: provide a framework for

- determining the relationships among MOEs, Measures of Performance (MOPs) and mission success; 2.1
- developing appropriate rules of engagement (ROE); 2.2
- determining the desired mission end-state, type of transition and transition criteria; and 2.3
- defining the relationships among the military, government agencies, coalition forces, and Non-Governmental Organizations (NGOs)/ Private Volunteer Organizations (PVOs). 3.1

COST ANALYSIS {9}: provide information on

- incremental costs of notional OOTWs to support the long-term analysis and 1.2.1
- relative (full) costs to support the selection of the mission plan. 1.2.3

D.4 ANALYZE TASKS

The function of this analysis procedure is to determine the tasks that must be accomplished. The analysis requirements for this analysis procedure are decomposed into OOTW tasks as follows.

FORCE PLANNING: DESIGNING FORCES {4}: identify tasks in

- infrastructure improvements; 5.5
- humanitarian operations; 5.6
- engineering support; 6.4
- medical support; 6.5
- joint/interagency/coalition support; and 6.6
- indigenous/client/refugee support, including location tracking. 6.7

COA DEVELOPMENT, ANALYSIS, COMPARISON {6}:

- identify tasks needed for adequate protection of all forces, including other agencies, coalition forces, and NGO/PVOs; and 5.2
- identify whether tasks involved in the use of force, whether lethal or non-lethal, are required. 5.7

COMMUNICATIONS ANALYSIS {8}: identify the tasks needed for communications, including non-standard communications with other government agencies, coalition forces, host government, and NGOs/PVOs. 3.9

D.5 DESIGN FORCE

The function of this analysis procedure is to designate the U.S. forces required for the operation and account for allied forces and non-governmental organizations. The analysis requirements for this analysis procedure are decomposed into OOTW tasks as follows.

IMPACT ANALYSIS {2}:

- gather and codify the cultural issues and to identify proper procedures with respect to cultural issues; and 3.11
- provide a framework for the METT-T analysis, answer "what-if" questions, and identify necessary materiel, human resources and procedures. 3.13

FORCE PLANNING: DESIGNING FORCES {4}: identify human resources, material and procedures. The domains are

- heavy vs light forces and weapons mix plus forces needed to open and maintain Lines of Communication (LOCs); 2.4
- active vs reserve forces, service mix (including Coast Guard), and coalition force mix. The decisions of this task are also conditioned on the range of expected contributions by civilian organizations, including NGO/PVOs; 2.5
- requirements to support media and public affairs; 3.16
- forces to support military contingency operations; 5.9
- balancing tooth to tail ratio; and 6.1
- balancing effectiveness vs availability/feasibility. 7.1

FORCE PLANNING: DEPLOYMENT SCHEDULING {5}: identify human resources, material and procedures. The domain is reserve call-up.

This task requires maintenance of information on immediate availability of reserves and availability of active service time. 4.1

COMMUNICATIONS ANALYSIS {8}: identify the human resources, materiel and procedures needed for communications, including non-standard communications with other government agencies, coalition forces, host government, and NGOs/PVOs. 3.9

D.6 ANALYZE LOGISTICS

The function of this analysis procedure is to determine the logistics support required for the operation. The single OOTW analysis requirement for this analysis procedure is decomposed into OOTW tasks as follows.

FORCE PLANNING: DEPLOYMENT SCHEDULING {5}: plan for adequate logistics and supply for all mission forces and to support humanitarian mission needs. 6.2

D.7 ANALYZE TRANSPORT

The function of this analysis procedure is to determine the transportation support required to initiate and sustain the operation. The single OOTW analysis requirement for this analysis procedure is decomposed into OOTW tasks as follows.

FORCE PLANNING: DEPLOYMENT SCHEDULING {5}:

- determine the sequence of arrival by units required to accomplish the mission and provide security; 4.2
- determine deployment priorities to resolve bottlenecks; 4.3
- determine availabilities and capabilities of the transport resources needed to accomplish the mission, including any transport needed for other agencies, coalition partners, and NGOs/PVOs; 4.4
- establish LOCs; and 5.1
- plan for transportation support for mission forces, including appropriate NGOs/PVOs and media personnel. 6.3

D.8 EVALUATE MISSION

The function of this analysis procedure is to evaluate the status of an ongoing operation. The analysis requirements for this analysis procedure are decomposed into OOTW tasks as follows.

SITUATION AWARENESS {1}: to permit a complete and accurate evaluation of the mission status, present

- impact forecasts; 1.1

- ISR, including information concerning threat, friendly and neutral elements and environmental information; 3.10
- cultural issues; 3.11
- results of the opposing COAs; 3.12
- METT-T analysis; 3.13
- centers of gravity; 3.14
- "enemy" threat; 3.15
- results of psychological operations (PSYOPs); 3.17
- casualty situation; 5.4
- infrastructure improvement requirements; and 5.5
- indigenous/client/refugee support requirements. 6.7

SITUATION AWARENESS {1}: present the mission status to permit media and public affairs support. 3.16

FORCE PLANNING: DESIGNING FORCES {4}: identify human resources, material and procedures. The domain is determining redeployment priorities, comparing effectiveness in current and future tasks against the availability or feasibility of alternative options. This includes consideration for rotation of troops. 7.1

COA DEVELOPMENT, ANALYSIS, COMPARISON {6}:

- evaluate the impacts of "enemy" actions and responses; 2.7
- evaluate the current probability of overall mission success; 2.8
- support the creation and codification of COAs; 3.2
- support preparation of staff estimates; 3.3
- evaluate the impacts of alternative COAs; 3.4
- evaluate the impacts of alternative stationing and allocation of forces; 5.3
- evaluate the impacts of various uses of force; and 5.7
- evaluate the impacts of repositioning forces and systems. 7.2

TRANSITION PLANNING AND TRACKING OF OPERATIONAL DATA {7}:

- support regular input of data and recalculation of the MOEs, probability of success, and transition criteria; 3.5
- feed the situation awareness tool; 3.6
- support regular input of data and evaluation of casualty and other medical data; and 5.4
- support continuous replanning of the transition. 7.3

COST ANALYSIS {9}: provide information on full costs of a particular OOTW to support the Congressional Budget process. 1.2.5

D.9 SUPPORT TRANSITION

The function of this analysis procedure is to support the transition from military activities. The single OOTW analysis requirement for this analysis procedure is decomposed into OOTW tasks as follows.

TRANSITION PLANNING AND TRACKING OF OPERATIONAL DATA {7}: provide current data to support the transition process. 7.3

D.10 ANALYZE RECOVERY

The function of this analysis procedure is to support the departure of U.S. forces and their reconstitution. The analysis requirements for this analysis procedure are decomposed into OOTW tasks as follows.

FORCE PLANNING: DESIGNING FORCES {4}: determine what retraining, etc., is needed to reconstitute the forces. 7.4

FORCE PLANNING: DEPLOYMENT SCHEDULING {5}:

- determine the sequence of departure of by units required to accomplish the mission and provide security; and 4.2
- determine availabilities and capabilities of the transport resources needed for departure, including any transport needed for other agencies, coalition partners, and NGOs/PVOs. 4.4

COST ANALYSIS {9}: provide information on

- costs incurred to support recovery of those costs from other U.S. agencies and from foreign organizations and governments; 1.2.4
- costs of a particular OOTW, including equipment depreciation, readiness losses, increased reserve recruitment and training costs, and perhaps other costs to support future acquisition, budgeting and training decisions; and 1.2.6
- actual costs of a completed OOTW to support improved estimates of future operations and reports to Congress on actual costs. 1.2.7